

CARNIVOROUS PLANT NEWSLETTER

Journal of the International Carnivorous Plant Society

Volume 52, No. 4

December 2023





CARNIVOROUS PLANT NEWSLETTER

Journal of the International
Carnivorous Plant Society
www.carnivorousplants.org

Volume 52, Number 4
December 2023



**Front and Back Covers: *Pinquicula ramosa*, Mt. Nyoho, Nikko, Tochigi Prefecture, Japan.
Photos by Justin Dunning. Article on page 218.**

Carnivorous Plant Newsletter is dedicated to spreading knowledge and news related to carnivorous plants. Reader contributions are essential for this mission to be successful. Do not hesitate to contact the editors with information about your plants, conservation projects, field trips, or noteworthy events. Advertisers should contact the editors. Views expressed in this publication are those of the authors, not the editorial staff.

All correspondence regarding dues, address changes and missing issues should be sent to the Membership Coordinator. Do not send such correspondence to the editors. Checks for subscriptions should be made to the International Carnivorous Plant Society in US funds. A one-year membership that includes a printed copy of CPN is US\$40. For additional membership options, see <https://icps.clubexpress.com/>.

International Carnivorous Plant Society, Inc.
2121 N. California Blvd., Suite 290
Walnut Creek, CA 94596-7351, USA
icps@carnivorousplants.org

President
Vice President
Secretary
Treasurer
Board Member
Board Member
Board Member
Board Member
Board Member

Membership Coordinator
Webmaster
Store Manager
Facebook Manager

CPN Editors editor@carnivorousplants.org
Managing Editor Bob Ziemer
Editor Barry Rice
Editor Karl Herold
Editor John Brittnacher

Richard Nunn, richardnunn@carnivorousplants.org
John Brittnacher, john@carnivorousplants.org
Cindy Slezak, cindy@carnivorousplants.org
Katy Maxwell, katy@carnivorousplants.org
Kenny Coogan, Education Director, kenny@carnivorousplants.org
Brent Jones, brent@carnivorousplants.org
Jan Schlauer, Cultivar Registrar, jan@carnivorousplants.org
Carson Trexler, Conservation Director, carson@carnivorousplants.org
Bob Ziemer, bob@carnivorousplants.org

Cindy Slezak, cindy@carnivorousplants.org
John Brittnacher, john@carnivorousplants.org
Mark Anderson, mark@carnivorousplants.org
Marcel van den Broek, marcel@carnivorousplants.org

Science Editor	Andreas Fleischmann
Science Editor	Fernando Rivadavia
Science Editor	Jan Schlauer

Date of effective publication of the September 2023 issue of Carnivorous Plant Newsletter: August 9, 2023.

The ICPS is the International Cultivar Registration Authority (ICRA) for the names of cultivated carnivorous plants according to the International Code of Nomenclature for Cultivated Plants. Send relevant correspondence to the ICPS, Inc.

Carnivorous Plant Newsletter is published quarterly in March, June, September, and December by the ICPS, Inc., 2121 N. California Blvd., Suite 290, Walnut Creek, CA 94596, USA. Periodicals postage paid at Walnut Creek, CA and additional mailing offices. Postmaster: Send address changes to ICPS, Inc., 2121 N. California Blvd., Suite 290, Walnut Creek, CA 94596, USA. Printed by Sheridan, 810 E. 10th Street, Lawrence, KS 66044. Logo and masthead art: Paul Milauskas.
© 2023 International Carnivorous Plant Society. All rights reserved. ISSN #0190-9215

CONTENTS

ICPS Conference 2024 – Vienna, Austria ----- 176

A new future: Carnivorous plant conservation and the ICPS ----- 178

Auburn University 2023 *Sarracenia oreophila* conservation project----- 180

Japan conference summary ----- 185

Japanese carnivorous plant groups and organisations ----- 189

A review of Japanese-native carnivorous plants----- 191

The 13th ICPS Post-Conference Tour to the greatest botanical gardens of Hyogo Pref., Japan -- 210

The 13th ICPS Post-Conference wetland expeditions ----- 215

The 13th ICPS Conference *Pinguicula ramosa* expedition ----- 218

New cultivars ----- 225

FROM THE EDITORS

ICPS conferences are a blast. You go to the conferences to be with fellow CP fanatics and make lifetime friends with people from all over the world. It was at the San Francisco 2000 conference where my involvement with the ICPS began.

This Japan special issue presents some of flavor of being at an ICPS conference. It also includes an invited article by Takaaki Kagawa summarizing the current taxonomic status of Japanese CPs.

ICPS conferences are organized by the local CP clubs and societies. There are typically presentations, plant shows and sales, group meals, and field trips. There is plenty of time to socialize with the other attendees.

After the pandemic, we are now getting back to our global cycle of conferences on even-numbered years. Next is the 2024 conference in Vienna, Austria, hosted by the GFP. It is not too early for people or organizations in the Americas to think about hosting the 2026 conference. In 2028 our cycle will be back to the Asia/Australia region.

—JOHN BRITTNACHER



CP art at the Orangery, Jardin botanique de Lyon, France, as part of the Lyon 2004 ICPS Conference.

ERRATUM: An error in the effective date of publication printed in the September 2023 issue (CPN 52(3): 126) is corrected to read: “Date of effective publication of the June 2023 issue of Carnivorous Plant Newsletter: May 1, 2023.”

—BOB ZIEMER

ICPS CONFERENCE 2024 – VIENNA, AUSTRIA

CHRISTIAN DIETZ • 2.vorsitzender@carnivoren.org
CARSTEN PAUL • vorsitzender@carnivoren.org
GÜNTER SEITER • oesterreich@carnivoren.org
DANIEL ROHRAUER • daniel.rohrauer@bundesgaerten.at

We are excited to announce the G.F.P. will host the next ICPS Conference from 24-26 May 2024 at Orangery of the Schönbrunn Palace in Vienna, Austria.

About the G.F.P.

The Gesellschaft für Fleischfressende Pflanzen im deutschsprachigen Raum G.F.P. e.V. (Carnivorous plants Society for the German speaking countries) was founded in 1984 and has grown to more than 1100 members. Our members are mostly from Germany, Austria, and Switzerland with a few members from other European countries and overseas.

We are active with lots of larger and smaller meetings throughout the summer season. The society is also active in nature conservancy as well as in scientific projects. We regularly support Botanical Gardens with conservation projects like building artificial ponds for an *Aldrovanda* project (Botanical Garden of Bonn and Frankfurt), building showcases for carnivorous plants exhibitions (Stuttgart, Ulm), or creating/maintaining artificial bogs (Leiden). In the research field, we have funded research projects in Canada, Malaysia, and Australia.

The Conference

The Conference will coincide with our 40th anniversary which we would like to celebrate with all of you. The Orangery of the Schönbrunn Palace is a beautiful venue for this event. There will be a plant sale as well as many lectures on all three days. On Friday evening we will offer a joint evening event and of course there will be the usual conference dinner on Saturday. We will also do our best to offer some excursions after the conference.

We created a website where you can always find the latest information about the conference like the program and registration process. You can find it here: <https://www.carnivoren.org/icps-conference-2024>

We will also announce the website through the channels of the ICPS, the known forums, and our own G.F.P. channels.

Vienna is worth a visit alone. The town is full of history and offers plenty possibilities for sight-seeing. Places like the Schönbrunn Palace, with the Orangery, the reserve gardens, the oldest zoo in the world, the Hofburg including the Hofreitschule, Belvedere Palace with the botanical garden, the Viennese Prater, and many more are well known and attract tourists from all over the world. This is your chance to visit this beautiful town and to learn something about the history of Austria.

Vienna can easily be reached by plane, train, or car.

Please don't hesitate to contact us should you have any questions. We are happy to help!



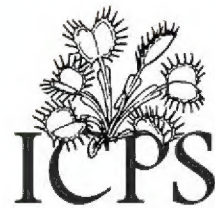
**ICPS-Conference & 40 Years G.F.P.
24th until 26th of May 2024
Orangery Schönbrunn Palace
Vienna, Austria**



**Schloss
Schönbrunn**



**HBLFA für Gartenbau und
Österreichische Bundesgärten**



A NEW FUTURE: CARNIVOROUS PLANT CONSERVATION AND THE ICPS

CARSON TREXLER • ICPS Director of Conservation & Research • carson@carnivorousplants.org

<https://doi.org/10.55360/cpn524.ct397>

Readers might know little of carnivorous plant conservation work were it not published in CPN. Conservationists themselves may not have time to interact with organizations like the ICPS without us taking the initiative. It has taken an effort for the ICPS to finally rediscover and meet with active workers after years of lapsed interaction.

We are all familiar with the unremittent tide of challenges and fears about the future of wild carnivorous plants that resurges with new urgency every year. Many fear that we do not challenge it back. The ICPS represents grassroots concerns about carnivorous plants at a global scale. Aside from habitat protection, poaching and human development remain largely unaddressed by the global community of enthusiasts. It may come as a surprise to find that projects exist to counter these challenges which the ICPS and its members can support.

The following report from Auburn University gives us important insights into on-the-ground work to protect the critically endangered *Sarracenia oreophila* under a recovery plan drafted and ratified by U.S. Fish and Wildlife Service biologists. The report details work performed by an expert crew of biologists and their students from Auburn, itself an institution with longstanding ties to carnivorous plant conservation and species status assessment in the Southeastern U.S. Thanks to their kind collaboration with the ICPS, we stand to learn much more from their conservation work in this critical age.

Projects supporting the recovery of critically endangered taxa and their habitat are ranked in the highest priority amongst the projects the ICPS will endorse in the coming years. Not only is our support effective protection for these critically endangered plants, projects such as *S. oreophila* habitat recovery are also secure choices. They are carried out with exacting federal guidelines and expert oversight. The workers are devoted and passionate about the plants and the projects have been active for over 20 years.

With the necessity of following exact protocols to be successful, nearly all conservation efforts are spread thin. Initiatives are prone to those crises that go hand-in-hand with shoestring budgets. The ICPS can find great purpose supporting conservation in this age of extinction. As a global forum, workers in diverse regions can learn much from each other, for their common mission is rife with challenges and goals. Showcasing these goals, challenges, and successes is important to the development of new practices. There are also prospects beyond habitat and plant protection. Collaboration between groups can strengthen our community. A unified approach may indeed attract the attention of new collaborators whom we do not yet know. The study of protected species and habitat, a long-term goal, becomes feasible when work to conserve them is put in.

More stories of conservation work will be published in CPN as our scope expands. There is no other journal more appropriate for it. Beyond CPN, these reports enrich a global study and effort to protect rare plants. There are many across the globe who are unaware that such projects exist, and are doubtful of the short- and long-term efficacy of conservation. The following report reveals much to the contrary.



Carson Trexler at a protected natural *Sarracenia oreophila* site in Alabama, May 2022. The entire population is framed within the image.

Support the ICPS conservation program by donating at our member website <https://icps.clubexpress.com>. Use this QR code to get there directly. You do not have to be member to donate. The International Carnivorous Plant Society is a registered US IRS 501(c)(3) nonprofit corporation.



AUBURN UNIVERSITY 2023 *SARRACENIA OREOPHILA* CONSERVATION PROJECT

PATRICK THOMPSON • Donald E. Davis Arboretum • Auburn University College of Sciences and Mathematics • 101 Rouse Life Sciences Building • Auburn • Alabama • thomppg@auburn.edu

AUGUSTUS KIRBY • Alpha Phi Omega • Delta Chapter • Auburn University • Auburn • Alabama • guskirby@gmail.com

Keywords: endangered species, habitat restoration, conservation, flora of Alabama

Received: 27 July 2023

<https://doi.org/10.55360/cpn524.pt849>

Abstract: During March 2023, 23 people worked to rehabilitate 6 wetlands in North Alabama containing a variety of rare plants. Each site contains species listed as threatened or endangered under the Endangered Species Act of 1973. These species are Green Pitcher Plants, *Sarracenia oreophila*, Giant Whorled Sunflowers, *Helianthus verticillatus*, and White Fringeless Orchids, *Platanthera integrilabia*.

During March 2023, 23 people worked to rehabilitate 6 wetlands in North Alabama containing a variety of rare plants. Each site contains species listed as threatened or endangered under the Endangered Species Act of 1973. These species are Green Pitcher Plants, *Sarracenia oreophila*, Giant Whorled Sunflowers, *Helianthus verticillatus*, and White Fringeless Orchids, *Platanthera integrilabia*. Actions at each site varied depending on the specific needs of the species present at that site along with the wishes of the property owners. Actions include cutting and removing brush, trees, and other vegetation from the bog areas, prescribed burning, and creation and maintenance of fire breaks, helping seedlings by manually clearing last year's leaf litter from their area, and removal of non-native invasive plant species. Since 2018, this project has been scheduled to coincide with Auburn University's Spring Break to give students in the Delta Chapter of the Alpha Phi Omega service fraternity an opportunity to do something meaningful in the plant community. This year, like the others, was a resounding success.

The effort to manage the smaller populations of *S. oreophila* in Alabama was spearheaded by the Alabama Chapter of The Nature Conservancy (TNC) in the 1980's and 90's. The group also invested themselves in the management of larger populations, other species including *S. alabamensis*, and well-known Alabama locations like Splinter Hill Bog. Since then, the Alabama Chapter of TNC has scaled up their efforts and now uses a variety of methods, especially prescribed fire, to achieve landscape level management of thousands of acres of natural areas in the state.

The Alabama Chapter of TNC has been an active member of the Alabama Plant Conservation Alliance (APCA) since its inception in 2008. It is through this relationship that the Alabama Chapter of TNC and Auburn University's Davis Arboretum were able to collaborate with the APCA's *S. oreophila* committee to establish site specific management objectives based on the U.S. Fish and Wildlife Service's recovery plan for *S. oreophila*. These were reviewed by the Service's lead biologists for *S. oreophila*, *H. verticillatus*, and *P. integrilabia* before any actions on the ground began.

The plans were individually proposed to landowners, including the state of Alabama's Department of Conservation and Natural Resources, to find out which stakeholders were willing to participate in the proposed recovery measures for the pitcher plants on their property. The willing parties are the ones whose properties are now involved in this project. We started with a single site

on private property in 2011 and began work at a second site on public land in 2015. The work at the second site received funding through Section 6 of the U.S. Endangered Species Act in 2019. This allowed for the purchase of tools which have been utilized annually to expand the impact of the funding to support the recovery of multiple species at multiple sites. Between 2019 and 2023, the scope of the project has expanded to include 9 locations, 4 on private property and 5 on state lands. This expansion was made possible by the repeated efforts of the staff of Auburn University’s Davis Arboretum and the student volunteers.

To make the work effective requires an understanding of the long-term goals and the status of progress at a given site. At a glance, a site might seem overgrown when in reality site managers are intentionally letting fuel loads increase in order to increase the intensity of a future prescribed fire. Well-meaning vigilante conservation actions can actually set back years-long efforts underway by professionals, or worse yet, go against the wishes of property owners. This can result in a complete loss of legal access to the plants, which can lead to the loss of entire populations of rare plants.

The work undertaken at these sites only goes forward after both the volunteers and the professionals involved are extensively trained. The tools utilized are dangerous and the remote locations require team members to train in programs like the National Outdoor Leadership School’s Wilderness First Responder certification course. Our workers have spent years training at the Arboretum before they join us in the field.

In the years since graduating, former students have continued to participate and assumed leadership roles at significant expense of their time and resources. This year, for the first time, the project received funds from the International Carnivorous Plant Society’s Conservation Fund to cover lodging for volunteers and Arboretum staff during the workdays, food for the workers, and part of the travel cost for the event organizer. Even though the volunteers were still rolling out sleeping bags to



Still smiling at the end of a day of work at a bog in Dekalb County, Alabama.

cram nearly a dozen people into a single cabin some nights, the boost to morale was huge. On the long trek back to the vehicles after a long day’s work, it meant a lot to the team to have a dinner from the International Carnivorous Plant Society to go back to. Thank you for your support.

Site List

- Site 1: Dekalb County, *S. oreophila* Primary
- Site 2: Dekalb County, *S. oreophila* Experimental outplanting 2
- Site 3: Marshall County, *S. oreophila* 1
- Site 4: Marshall County, *S. oreophila* 2
- Site 5: Dekalb County, *S. oreophila* Primary outlier
- Site 6: Dekalb County, Orchid Bog
- Site 7: Dekalb County, *S. oreophila* Experimental outplanting 1
- Site 8: Dekalb County, *H. verticillatus*
- Site 9: Cherokee County, *H. verticillatus*

Narrative

- 3 March 2023:** Brush cutter work to remove sprouts from cut stumps within a roadside population of *H. verticillatus* at Site 9. Travel day, check-in, orientation, planning meeting.
- 4 March 2023:** The cabin crew finalized the menu for the week, made plans and a grocery list, and then went shopping. The rest of the group split up between surveying Site 1 and 2 and work at Site 5. Site 5 is on privately owned land, and large groups are not conducive to the landowner’s



Prescribed fire is one of the best management tools for *Sarracenia* in the wild.

preferences. A small strike force went over in the morning and ran the brush cutters around the 8 *S. oreophila* at the site. Lower limbs were pruned off trees around the bog to increase light at the ground.

In the afternoon the entire group went to Site 8 to monitor the growth and survival of experimental outplanting of *H. verticillatus*. Ten small rhizome divisions were planted 26 months ago. Seven of the plantings are extant and have expanded to dense clusters 50-75 cm across. Workers removed invasive species and cleared area around the plantings.

5 March 2023: The group worked a long day at Sites 3 and 4 in Marshall County. These sites were over an hour drive from camp. Last year, 800 m² was cleared and dragged away from the *S. oreophila* at Site 4. This year, gas powered brush cutters were used to take the resprouting stumps down to the ground.

At Site 3 the hole in the canopy was expanded from 780 m² to 1203 m². The understory was removed in an additional 2396 m² of adjacent woods. This increases the total area of available habitat at Site 3 to 3599 m² over 3 years of management of this site after a lapse of approximately 20 years. The estimate of lapse in management is based on counts of the growth rings in the encroaching woods at the site. All debris cut down was dragged out by hand and stacked in tight piles away from the bog area.

6 March 2023: This day was spent at Sites 1, 2, and 6. The 3 sites are within a 2.5-hectare burn unit. The group was divided into strike teams to accomplish specific objectives within the burn unit. One team cut down the brush and trees recruited in the last year at the *S. oreophila* bogs at Site 1 & 2. Another team cut up the trees that had fallen over the firebreak and expanded the width of the majority of the break to allow an ATV to access the area to patrol the fire line or perform rescue operations. Another team ran leaf blowers to clear the fire break to bare dirt for a minimum width of 2 m. Clearing at Site 6 for *Platanthera integrilabia* is slow due to a dense and very wet understory



A flush of spring growth on *Sarracenia oreophila* in Dekalb County, Alabama.

and took most of the afternoon. A team opened the canopy at an interior location within the unit that holds standing water for part of the year in hopes that this will develop into habitat available for *S. oreophila*.

7 March 2023: The first part of the day the group eliminated Chinese Privet from around our camp, which is less than 150 m from a streamside occurrence of *S. oreophila* where the plants are growing in a sandy riverbank. The group was happy for this distraction while they waited for the weather parameters to fall within the required limits specified in the burn plan to apply the prescribed fire for which they had spent the previous day preparing. The relative humidity and wind speed both dropped to acceptable levels late in the morning, and the crew relocated and commenced with a controlled burn of Sites 1, 2, and 6. Several of the volunteers had never participated in a burn, so the day was very educational. The burn went according to plan with no damage to person or property.

8 March 2023: This day was spent at Site 7, an experimental outplanting of *S. oreophila*. This site is an outplanting of seedlings grown from seeds collected from a population 8 km away. Sawyers managed hazard trees, took down 5 mature upper canopy trees, and girdled several others to increase light levels at the ground and reduce competition for water. Brush cutters and volunteers with loppers cut back the resprouts and recruits from last year's clearing. All teams worked to cut a new fire break around the bog for future prescribed burns.

9 March 2023: The group spent the morning eliminating Chinese Privet from around the camp. The project concluded for the year after lunch, and the team dispersed for their homes across 8 different Southeastern states. All team members look forward to making the project a success again in 2024.



Spring in a bog in Dekalb County, Alabama, with *Sarracenia oreophila*, *Osmunda cinnamomea*, and *Rhododendron canescens*.

ICPS CONFERENCE 2023 – HIMEJI, JAPAN

KOJI KONDO • Kobe • Japan • kokonchip@gmail.com

Keywords: Japan, ICPS conference, 2023

Received: 6 August 2023

<https://doi.org/10.55360/cpn524.kk223>

Abstract: Summary of the 13th ICPS World Conference held 26-28 May 2023 in Himeji, Japan.

The 13th ICPS World Conference was held on 26-28 May 2023 at Himeji Citizens' Hall. We chose Himeji because of the vicinity of the Hyogo Prefectural Flower Center (HPFC) of which the amazing CP collection was discussed by Naoki Tanabe in the previous ICPS Conference held in California in 2018. Also, there is Himeji Castle, a World Heritage Site, so many accommodation facilities are available.

This conference was sponsored by the Japanese Carnivorous Plant Society (JCPS) with support by the Kansai CPS, the Tokai CPS, and the Hiroshima CPS. The conference, originally planned in May 2020, has been postponed 3 times (!) due to the COVID-19 pandemic. Thanks to the significant calming down of COVID since the fall of 2022, we were finally able to hold the conference with participation of more than 110 people from Japan and 13 overseas countries.

A total of 18 lectures were given in English and Japanese taking 50-60 minutes each because of using 2 languages. As all of the speakers on Day-1 were Japanese researchers (including one US-based), they kindly agreed to self-interpret. On Day-2 and Day-3, we invited two professional interpreters for consecutive interpretation. Thus, more Japanese hobbyists were able to participate in the conference and listen to valuable lectures. The particularly noteworthy was that 2 school students of Tatsuno High School gave the presentation bilingually; the professional interpreter helped only the Q&A part.



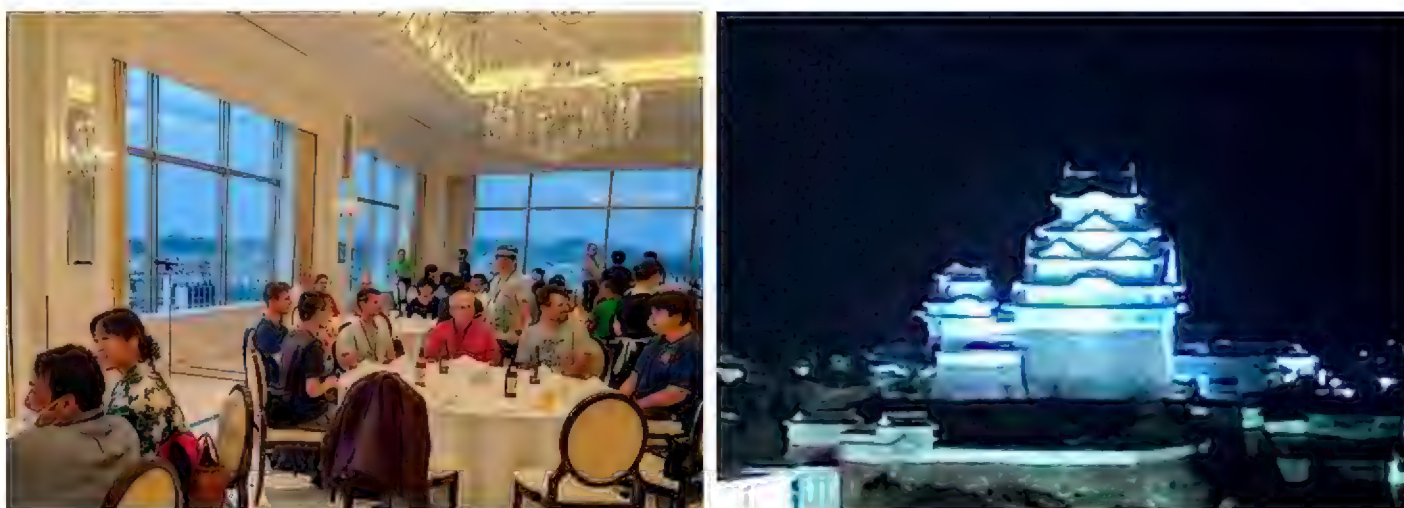
Conference participants in front of Himeji Citizens Hall.



Left: Audience of the conference. Right: Lecture by the students of Tatsuno High School. Photos by Naoki Tanabe.

There were 4 remote lectures using Zoom: Jan Schlauer and Andreas Fleischmann from Germany on Day-2 and Drew Martinez from the US and Greg Bourke from Australia on Day-3. These remote lectures were conducted smoothly without any noticeable issues.

Themes of the lectures were, in descending order, mechanism of prey trapping (signal transmission, roles of chemicals, evolution of carnivory), chemical components in plants (naphthoquinone in *Drosera*, phenolic compounds in *N. khasiana* and sugars/metals in *Nepenthes* extrafloral nectar), conservation of native habitats (sundews in southern Hyogo, *Sarracenia* in Alabama), field trip reports of native habitats (CPs in eastern Australia, *Pinguicula* in Mexico), ecology and morphology (*D. tokaiensis*, *Darlingtonia*), sundew-insect symbiosis, and the effects of environmental pollution. Two lectures also explained about simplified aseptic cultivation methods for carnivorous plants without using an autoclave and a laminar flow cabinet but using calcium hypochlorite (Lecture #6 Kawauchi) or slightly acidic electrolyzed water (Lecture #13 Tsubosaka).



Left: Conference dinner at Hotel Monterey. Right: View of Himeji Castle from the banquet room. Photos by Naoki Tanabe.

On 26 May evening, the conference dinner was held with about 100 people at the banquet room of Hotel Monterey Himeji, from which the lit-up Himeji Castle can be observed. The participants enjoyed the buffet-style foods and demonstrations of *nigiri-sushi* and *tempura* with *sake* and Japanese wines. As an entertainment of the dinner, a short magic show was performed by Naoki Tanabe during the dinner.

Plant show and sale event was also held in the same building from 1:00 p.m. on 26 May through 3:00 p.m. on 28 May. Selected plants such as *Nepenthes*, *Sarracenia*, *Pinguicula*, *Aldrovanda*, and *Roridula* were brought and exhibited by the botanical garden, CP societies, and nurseries. Variety of plants, T-shirts, CP designed figures/ornaments, etc. were on sale. Before the opening at 1 p.m. on 26 May, a line of more than 30 people was formed and significantly above 200 people visited during the two-and-a-half-day sale period.



Left: Preparation of sale booth. Photo by Ako Minami. Right: Bustling sales booths. Photo by Naoki Tanabe.

There were 3 post-conference events. On 29 May, 74 people joined the day trip to the Tegarayama Conservatory Botanical Garden in Himeji City and the Hyogo Prefectural Flower Center (HPFC) in Kasai City, ca. 50-min. drive from Himeji station.

On 30 May, there was a local field trip to 2 habitats in Kato City and Taka Town in Hyogo Prefecture with participation of 45 people. Observed plants were *D. lunata*, *D. tokaiensis*, *D. spatulata*, *D. rotundifolia*, and a few *Utricularia*.

The very last event was the field trip to the habitat of *Pinguicula ramosa*, Japan endemic species, in Nikko, Tochigi Prefecture on 31 May.

I would like to express big thanks to Prof. Hasebe, who strongly supported us from the preparation stage to the conference lectures from academic view point, Mr. Doi of HPFC, who cooperated for the HPFC tour and the exhibition/sale, Mr. Asai of the Tegarayama Conservatory Botanical Garden for the heart-warming tour, and Ms. Hasegawa of the Himeji Convention & Visitors Bureau for securing the venue and helping the subsidy from Himeji City.

Lectures in the 13th ICPS World Conference – Himeji, Japan

1. Mitsuyasu Hasebe - National Institute for Basic Biology, Okazaki, Aichi, Japan
Molecular mechanisms of evolution in botanical carnivory and introduction of carnivorous plant in the wild habitats.
2. Hiraku Suda - Biochemistry and Molecular Biology, Saitama University, Saitama, Japan
The sensory system of the Venus flytrap: Glowing flycatchers reveal molecular dynamics.
3. Shoji Segami - National Institute of Basic Biology, Okazaki, Aichi, Japan
Analysis of electrical signals running through the tentacles of the sundew *Drosera rotundifolia*.

4. Takahiro Katogi, Yoshikazu Hoshi - School of Biology, Tokai University, Kumamoto, Japan
A study of glandular trichome densities on the leaves of Japanese endemic species *Drosera tokaiensis* and its related species.
5. Emmi Kurosawa - University of Massachusetts, Boston, MA, USA
Vegetarian or Meat Lover!? Water quality may affect carnivory in aquatic *Utricularia* spp. in Australia.
6. Takumi Kawauchi - Agriculture and Life Science, University of Tokyo, Tokyo, Japan
Introduction of simplified aseptic cultivation technique for carnivorous plants and report on endophytic microorganisms in *Sarracenia*.
7. Andrej Pavlovič - Dept. of Biophysics, Faculty of Science, Palacký University, Olomouc, Czech
Phylogeny of jasmonate signaling in carnivorous plants.
8. David Armitage - Integrative Community Ecology Unit, Okinawa Institute of Science and Technology Graduate University, Japan
Charmed by the cobra: research on the ecology of *Darlingtonia californica*.
9. Gokul B. S. - Phytochemistry & Phytopharmacology Div., J. Nehru Tropical Botanic Garden & Research Institute, Kerala, India
Isolation and biological activity studies of two phenolic compounds from the Indian pitcher plant *Nepenthes khasiana*.
10. Anil John J. - Phytochemistry & Phytopharmacology Div., J. Nehru Tropical Botanic Garden & Research Institute, Kerala, India
Chemical composition of extrafloral nectar in *Nepenthes khasiana* pitchers.
11. Jan Schlauer - University of Tuebingen, Tübingen, Germany [Remote Lecture]
Spider leg sundews of Japan – Chemistry, morphology and Identification.
12. Andreas Fleishmann - GeoBio Center, University of Munich, Munich, Germany [Remote Lecture]
Insects associated with *Drosera*.
13. R. Tsubosaka, S. Kawashima, K. Fujiwara - Nature Science Club, Tatsuno High School, Hyogo, Japan
Carnivorous plants in southern Hyogo Prefecture - Activities of high school students to protect local biodiversity.
14. Drew Martinez - Carnivero' Nurseries & Gardening Store, Austin, TX, USA [Remote Lecture]
Technological advances in carnivorous plant horticulture.
15. Greg Bourke - Blue Mountains Botanic Garden, Sydney, Australia [Remote Lecture]
Carnivorous plants in South-Eastern Australia.
16. Carl Procko - Plant Molecular & Cellular Biology, Salk Institute, La Jolla, CA, USA
Molecular evolution of prey touch responses in carnivorous *Droseraceae* plants.
17. Carson Trexler - ICPS Director of Conservation & Research, Portland, OR, USA
The ICPS support of imperiled *Sarracenia* habitat conservation in Alabama in 2023.
18. Daisuke Matsue - Hakone Botanical Garden of Wetlands, Hakone-machi, Kanagawa, Japan
Field trip report of *Pinguicula* habitats in Mexico.

JAPANESE CARNIVOROUS PLANT GROUPS AND ORGANISATIONS

TAKAAKI KAGAWA • Tokyo • Japan • takaakikagawa036@gmail.com

Keywords: Japan, carnivorous plants, societies, ICPS conference, 2023

Received: 1 August 2023

<https://doi.org/10.55360/cpn524.tk783>

Abstract: The 13th ICPS International Conference, held in Himeji City, Japan, in May 2023, was supported by a nation-wide network of carnivorous plant groups and organisations in Japan.

The 13th International Conference of ICPS successfully ended in May 2023, after the third postponement due to the COVID-19 pandemic. The conference was supported by the nation-wide network of carnivorous plant groups and organisations in Japan. Members of these groups and organisations have actively collaborated for a long time for their common passion.¹ In this brief article I list 11 major ones in the country along with some trivia:

1. Hamatonbetsu Shokuchūshokubutsu Kenkyūkai (‘Hamatonbetsu Carnivorous Plant Society’)

A local society based in Hamatonbetsu, Hokkaido Prefecture. IPS (see below) was involved in the foundation. This society is aimed at habitat conservation and environmental education.

2. Hiroshima Carnivorous Plant Society (HCPS)

A regional society that is active in Hiroshima Prefecture. HCPS has connections with famous local nurseries, and their main activities include sales and exhibitions as well as a regular meeting.

3. Hokkaidō Mōsengoke Kurabu (‘Hokkaido Sundew Club’)

A local group from Hokkaido Prefecture. This group works on habitat conservation and environmental education.

4. The Insectivorous Plant Society (IPS/IPS, Japan)

A society in Tokyo that focuses on research, cultivation, conservation, and promotion of carnivorous plants. IPS was founded in 1949, which apparently makes it the oldest in the world. The core members have aged, but the organisation is still active today. They hold a regular meeting and publish a quarterly Japanese-language journal.

5. Japanese Carnivorous Plant Society (JCPS)

A Kanto-based organisation that aims at nation-wide hobbyists. JCPS has connections with regional societies and organises a monthly meeting called Kantō Shūkai (‘the Kanto Meeting’). Kantō Shūkai is also known as ‘Hamadayama Shūkai’ (‘the Hamadayama Meeting’), because it used to be held at a citizen hall in Hamadayama, Tokyo. They issue a quarterly informal newsletter in Japanese.

¹ JCPS, KCPS, TCPS, and others (see the list) organise together an annual gathering called the ‘Summit’ for avid enthusiasts, in addition to their own regular meetings.

6. Kansai Carnivorous Plant Society (KCPS)

KCPS has been active in Kansai/Kinki² Area. This regional society was previously an unofficial open meeting held by members of IPS (see above) in this area. They have many experienced members as well as connections with the local botanical gardens and professional horticulturists. KCPS's regular meeting is called 'Kansai Shūkai' ('the Kansai Meeting').

7. Niigata-ken Shokuchūshokubutsu Aikōkai ('Niigata Prefecture Carnivorous Plant Society')

This is a regional society in Niigata Prefecture, Honshu, which has some active enthusiasts. This society is famous for their discoveries of *Utricularia minor* f. *terrestris* sites and low-altitude populations of *Pinguicula macroceras*.

8. Nippon Utsubokazura Kyōkai

An association founded by Hiroshi Suzuki, the owner of a nursery in Yamanashi Prefecture in Kanto Region. This society is focused on horticulture of *Nepenthes* and conservation of cultivated strains. They exhibited at the 13th ICPS International Conference as 'Nippon Nepenthes Society'. Also, Suzuki's nursery 'Hiro's Pitcher Plants' has been hosting the annual intersociety gathering aka 'Summit' since 2018.

9. Shokuchūshokubutsu Konwakai ('Carnivorous Plant Discussion Group')

A local group that is based at the Higashiyama Zoo and Botanical Gardens in Nagoya, Aichi Prefecture. This group was founded by horticulturist Masahiro Kondo, the father of botanist Katsuhiko Kondo. Their aims are research, conservation, and promotion of carnivorous plants.

10. Shokuchūshokubutsu Tansakukai ('Carnivorous Plant Spotting Group')

A Kansai/Kinki-based group led by Makoto Miyamoto, a 'planthunter' who has had adventures around the world for carnivorous plants. This group is mainly focused on field trips. They used to have a joint regular meeting with KCPS (see above) as they share many members.

11. Tokai Carnivorous Plant Society (TCPS)

A regional society in Tokai Region, the mid-south part of Honshu. Tokai Region has been famous for horticulture and is home to many early adopters and pioneers regarding carnivorous plant enthusiasm. Their regular meeting is called Tōkai Shūkai ('the Tokai Meeting').

² 'Kinki' is Japan's previous capital area including Kyoto and the surrounding regions, even though it may sound 'unfortunately familiar' by coincidence to English speakers. It is almost synonymous to 'Kansai', which is a word coined as opposed to 'Kanto'. The name 'Kanto' originally means 'eastern wilderness beyond the border gate', and Kansai means 'the opposite side (west) from the border gate'. Some people may recognise these region names from *Drosera* labels before the early 2000s.

A REVIEW OF JAPANESE-NATIVE CARNIVOROUS PLANTS

TAKAAKI KAGAWA • Tokyo • Japan • takaakikagawa036@gmail.com

Keywords: Japan, native, endemic, taxonomy, unresolved, *Aldrovanda*, *Drosera*, *Pinguicula*, *Utricularia*, *Triantha*, Droseraceae, Lentibulariaceae, Tofieldiaceae

Date Received: 1 August 2023

<https://doi.org/10.55360/cpn524.tk858>

Abstract: We list Japanese-native carnivorous plant species and hybrids from four genera in two families, based on Komiya (2002) with some revisions and modifications. We also discuss facts and recent findings on selected species and hybrids from the list. Additionally, we review those of uncertain taxonomy or distribution as well as a potential carnivorous species.

Introduction

Japan is home to approx. 20 carnivorous plant species. The nation's current territories consist of four main islands, namely Hokkaido, Honshu, Shikoku, and Kyushu, and smaller islands surrounding them. Each one of the main islands can represent a region or area. According to the Japan Meteorological Agency website, Japan covers a climate range from subarctic to subtropical.

A list of Japanese-native carnivorous plant species and hybrids

Following is a list of Japanese carnivorous plant species and hybrids after Komiya (2002) with revisions and modifications:

Droseraceae

***Aldrovanda vesiculosa* L.**

Distr.: Honshu

***Drosera anglica* Huds.**

Distr.: Hokkaido and North-central Honshu (Oze)

***Drosera indica* L. complex**

Distr.: Honshu and Kyushu

***Drosera lunata* Buch.-Ham. ex DC.**

Distr.: Kyushu, Shikoku, and Central and Southern Honshu

***Drosera rotundifolia* L.**

Distr.: Hokkaido, Honshu, Shikoku, and Kyushu¹

¹ The southern limit is Yakushima (or Yaku Island) near Kyushu Island.

***Drosera spatulata* Labill.**

Distr.: Kyushu, Shikoku, Central and Southern Honshu, and Ryukyu Islands

***Drosera tokaiensis* (Komiya & C.Shibata) T.Nakamura & Ueda**

Distr.: Central Honshu and Northeast Shikoku (endemic)

Drosera anglica* × *rotundifolia

= *D. ×obovata* Mert. & Koch

***Drosera rotundifolia* × *spatulata* (Seno 2003; Hayakawa et al. 2012)²**

= *D. ×hyugaensis* (Seno) Ichihashi, Hattori & Minami ex Kagawa comb. et stat. nov.

= *D. hyugaensis* n. n. in Ichihashi *et al.* (2006)

Basionym: *D. tokaiensis* (Komiya & C.Shibata³) T.Nakamura & Ueda subsp. *hyugaensis* Seno in Journal of Japanese Botany 78(3): 170-174.

Drosera rotundifolia* × *tokaiensis

***Drosera spatulata* × *tokaiensis* (Nakamura 1993)**

Lentibulariaceae

***Pinguicula macroceras* Pall. ex Link**

= *P. vulgaris* L. (unresolved)

Distr.: Hokkaido, Honshu, and Shikoku

***Pinguicula ramosa* Miyoshi**

Distr.: North-central Honshu (Nikko; endemic)

***Utricularia aurea* Loir.**

Distr.: Central and Southern Honshu, Shikoku, Kyushu, and Ryukyu Islands

***Utricularia bifida* L.**

Distr.: Honshu, Shikoku, Kyushu, and Ryukyu Islands

***Utricularia caerulea* L.**

Distr.: Hokkaido, Honshu, Shikoku, Kyushu, and Ryukyu Islands

***Utricularia dimorphantha* Makino**

Distr.: Honshu (endemic)

² Seno (2003) described this F1 interspecific hybrid as *D. tokaiensis* (Komiya & C.Shibata) T.Nakamura & Ueda subsp. *hyugaensis* Seno. The original combination erroneously suggests that this hybrid branched from *D. tokaiensis*, which I think has a logical issue (Discussed in Kagawa 2017).

³ The author name 'C.Sibata' in Seno (2003) is corrected to the original spelling 'C.Shibata'.

- Utricularia gibba* L.⁴**
 = *U. exoleta* R.Br. (unresolved)
 Distr.: Central Honshu, West Shikoku (Fukuoka & Hayakawa 2019), Kyushu, and Ryukyu Islands
- Utricularia intermedia* Hayne**
 Distr.: Hokkaido, Honshu, and Northern Kyushu
- Utricularia macrorhiza* LeConte**
 Distr.: Hokkaido and extreme north of Honshu
- Utricularia minor* L.**
 Distr.: Hokkaido, Honshu, Shikoku, and Kyushu
- Utricularia minutissima* Vahl**
 Distr.: Central Honshu (Tokai Region)
- Utricularia tenuicaulis* Miki**
 = *U. australis* R.Br. sensu Kadono (2014)
 Distr.: Honshu, Shikoku, Kyushu, and Ryukyu Islands
- Utricularia uliginosa* Vahl**
 Distr.: Hokkaido, Honshu, Shikoku, and Kyushu⁵
- Utricularia tenuicaulis*⁶ × *macrorhiza* (Kameyama *et al.* 2005)**
 = *U. ×japonica* Makino (according to Kadono 2014)
- Utricularia intermedia* × *minor***
 = *U. ×ochroleuca* R.W.Hartm.⁷

Notes on selected Japanese-native carnivorous plant taxa from the list

Droseraceae

***Aldrovanda vesiculosa* (Fig. 1)**

Flowers of this species were unknown until Makino (1893). Komiya (1989) lists 10 Japanese populations, including two introduced ones, from parts of Honshu. The plants of Japanese forms stay green. This species is nearly or completely extinct in the major habitats in the country, although a previously unknown population was discovered in 2022 (Nishihara *et al.* 2023).

⁴ I adopted Taylor’s (1989) classification, but Japanese researchers often mention it as *U. exoleta* R.Br. (e.g., Fukuoka & Hayakawa 2019; Kadono 2014; Komiya 2002). Further taxonomic research would be required.
⁵ The southern limit is Yakushima (or Yaku Island) near Kyushu Island.
⁶ As *U. australis* f. *tenuicaulis* in Kameyama *et al.* (2005).
⁷ Komiya (2002) lists *U. ochroleuca* as a species, but I adopted the hypothesis that it is a group of natural hybrids between *U. intermedia* and *U. minor* (Böcher *et al.* 1968 among many others), and therefore I treated *U. ×bentensis* Komiya as one of its synonyms. Rice (2018) considers *U. ×bentensis* as synonymous to *U. bremii* Heer ex Kölliker.



Figure 1: A cultivated plant of *Aldrovanda vesiculosa* from Oguraike (or Ogura Lake), which once existed in Kyoto Prefecture, Honshu.

***Drosera indica* L. complex (Fig. 2)**

White-flowered and pink-flowered groups are known from Japan. The white-flowered group is reported from Honshu and Kyushu while pink-flowered group is confined to a part of Central Honshu. In Japan, this species complex has an annual life cycle, and seeds of both the groups germinate after exposure to low temperature.

Watanabe *et al.* (2013) argue that the white-flowered and pink-flowered groups belong to separate species after their allozyme/morphology/cross-pollination analysis, supporting *D. makinoi* Masam. for the white-flowered group. Watanabe (2014) refers to the pink-flowered group as *D. toyoakensis* M.Watanabe, but no published description seems to exist.⁸ Robinson *et al.* (2017) tentatively treat both the pink-flowered and white-flowered groups as *D. indica*.

Kagawa (2017) compares with limitations the epidermal hairs in the two groups, pointing out the morphological similarities between the pink-flowered and white-flowered groups in this regard as well as between these groups and *D. serpens* Planch.⁹ Having said that, the relationship between *D. serpens* and Japanese *D. indica* complex is still poorly understood. Also, most Japanese studies of this section have only focused on the local *D. indica* complex, but these *Arachnopus* members would require to be a part of comprehensive research for further insight.

⁸ There is a confusion on the status of *D. toyoakensis* M.Watanabe in Kagawa (2017). Watanabe *et al.* (2013) revise the white-flowered group as *D. makinoi*, but they include no description of the pink-flowered group.
⁹ Schlauer *et al.* (2019) consider the pink-flowered group as a form of *D. serpens* and the white-flowered group as a separate taxon after observing the epidermal hairs.



Figure 2: Specimens of Japanese *Drosera indica* complex. (A-B) Pink-flowered plants from Aichi Prefecture, Honshu. Photos by Masaaki Senda. (C-D) White-flowered plants (= *D. makinoi* in Watanabe *et al.* 2013) in Chiba Prefecture, Honshu.

Drosera lunata

D. lunata is the only tuberous species that is reported from Japan. Mature plants of Japanese forms mostly start ascending without producing basal leaves. Young plants, however, form a basal rosette. Some populations are found in limestone areas.

***Drosera rotundifolia* (Fig. 3)**

D. rotundifolia is the most common *Drosera* species in Japan. It has adapted to a wide range of environments such as marshlands, mountain forests, limestone areas, or even coasts in some cases. There is high diversity in the morphology/ecology of this species.

Despite its circumboreal distribution, this species is sometimes found in habitats where the plants are exposed to hot summer¹⁰. In Southern Kyushu, for example, some populations have adapted to a subtropical climate and acquired more heat tolerance and a shorter winter dormancy than others have. Some populations in such environments have developed an almost annual life cycle and produce more flowers in order to survive the summer heat and/or drought as seeds, rather than as plants (Yotsumoto, Susumu. 2005. Personal communication, published in Kagawa 2017).

In Honshu and Kyushu, pink-flowered clones are sometimes found, even though this species normally produces white flowers. These clones are also characterised by redder petioles and/or

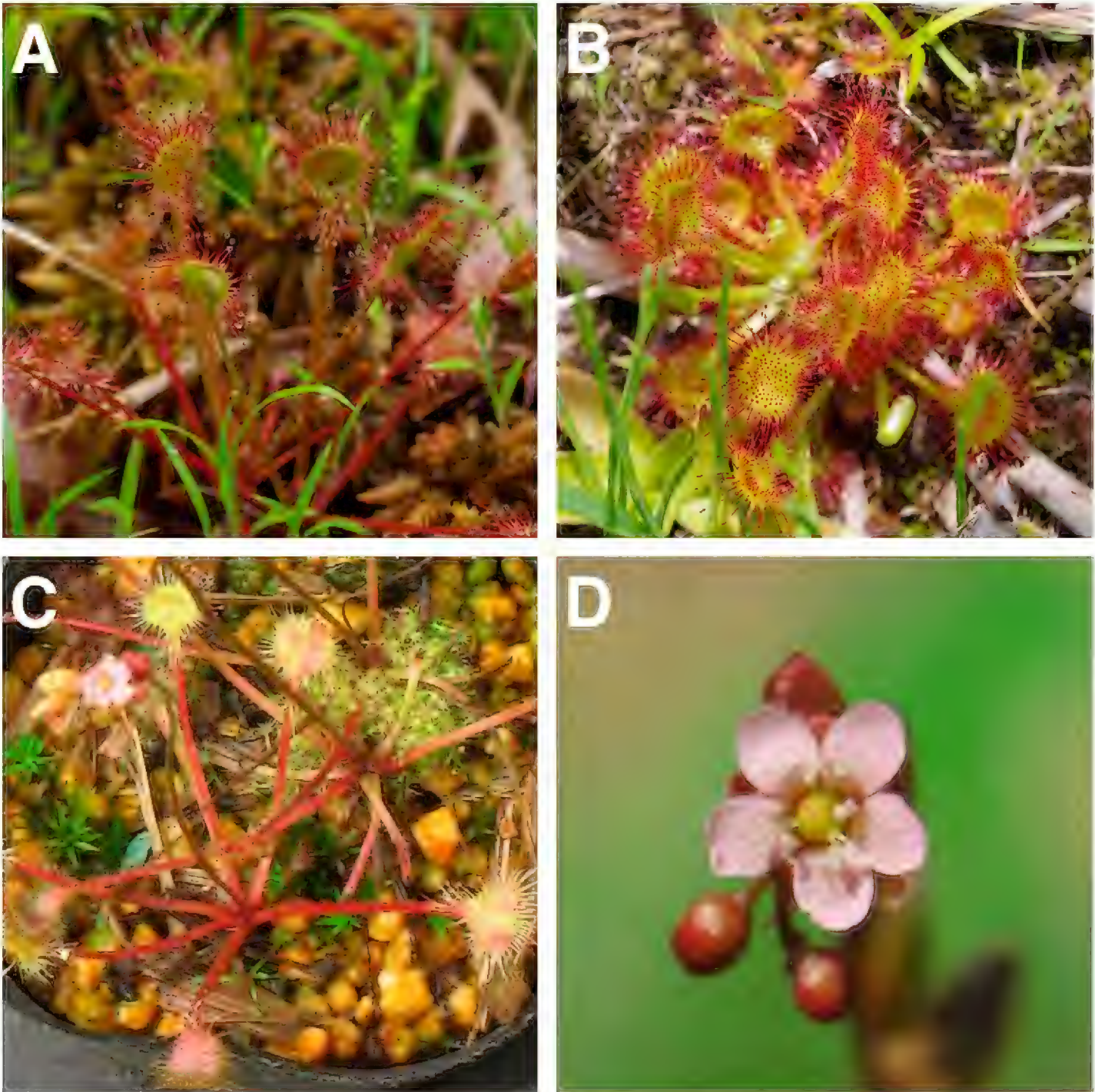


Figure 3: *Drosera rotundifolia*. (A) In Niigata Prefecture, Honshu. Photo by Takaaki Kagawa. (B) In Kumamoto Prefecture, Kyushu. Photo by Takaaki Kagawa. (C-D) Pink-flowered *D. rotundifolia* in cultivation (after kokobohusi 2012).

¹⁰ There are tropical populations reported from the Southern Hemisphere, but they occur in cool tropical highlands (Coritico & Fleischmann 2016; Fleischmann 2021).

laminae than those of white-flowered clones from the same populations. The petal pigmentation, however, is inconsistently exhibited. The pink flowers are likely to be genetic, but they require certain conditions to be expressed, without which the same plants can produce white flowers¹¹. What triggers the coloration is still a mystery.

***Drosera tokaiensis* (Fig. 4)**

D. tokaiensis is a Japanese endemic of a hybrid origin. This species was previously known as *D. spatulata* Labill. subsp. *tokaiensis* Komiya & C.Shibata (Komiya & Shibata 1978), or the ‘Kansai

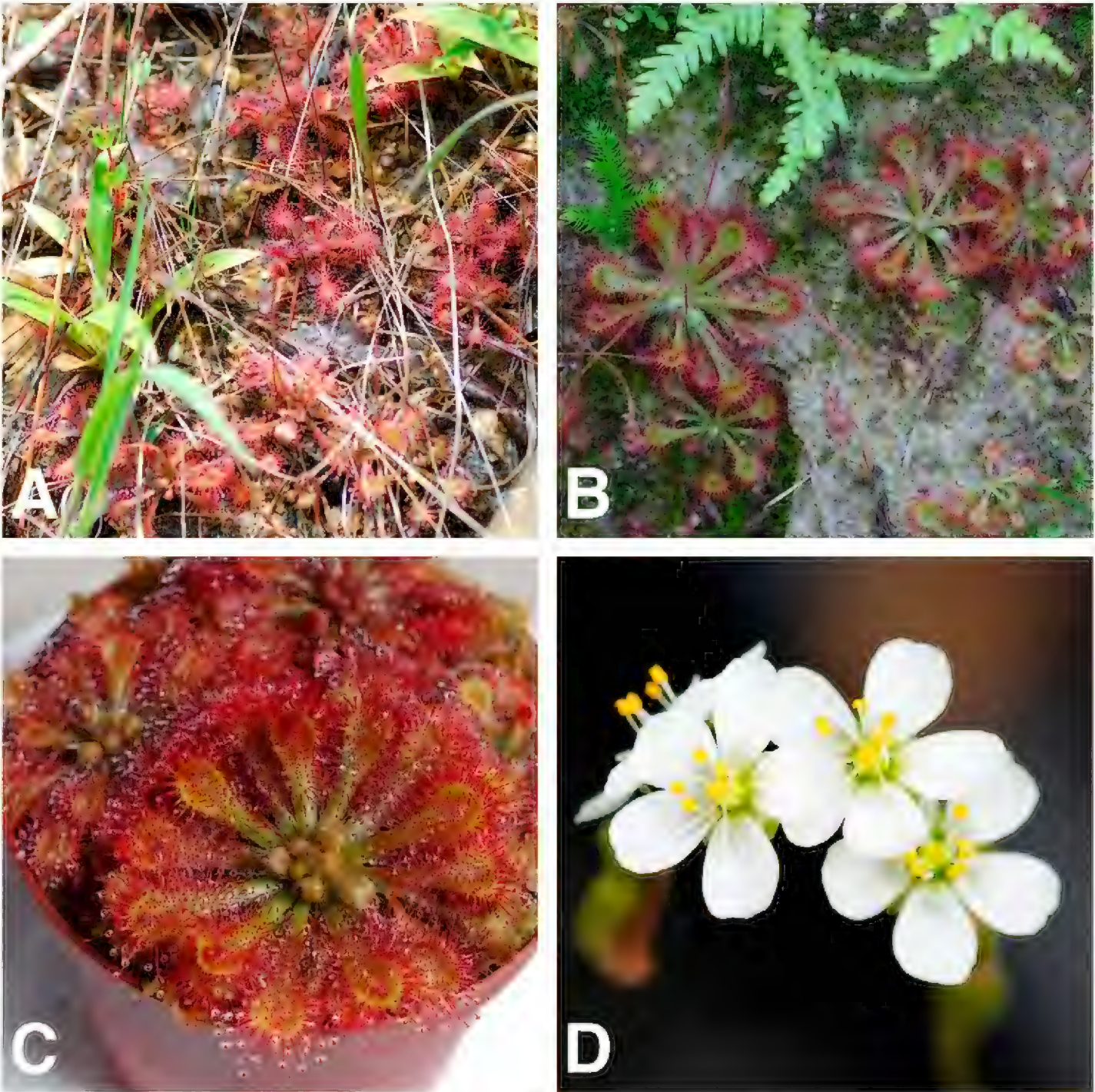


Figure 4: (A) *Drosera tokaiensis* in Shiga Prefecture, Honshu. Photo by Masaaki Senda. (B) *D. tokaiensis* in Kagawa Prefecture, Shikoku. Photo by Takaaki Kagawa. (C) In cultivation. Photo by Takaaki Kagawa. (D) Flowers of white-flowered *D. tokaiensis*. Photo by Takeru Okamoto.

¹¹ kokebohusi (2013) has a similar note.

form of *D. spatulata*'. However, Nakamura & Ueda (1991) concluded in their morphological and chromosomal study that it is an allopolyploid species which originated from a hybrid between *D. rotundifolia* and *D. spatulata*.

The plant morphology varies slightly among the regional forms. As far as the flowers are concerned, they are normally pink, but enthusiasts have noticed white-flowered clones on a small island under the administration of Hyogo Prefecture. White flowers are commonly observed in anthocyanin-deficient plants, but these white-flowered clones of *D. tokaiensis* exhibit full anthocyanin pigmentation in their plants (cf. Ksepka 2022).

Nakanishi (2019) claims to have discovered a new population of *D. tokaiensis* in a habitat of *D. rotundifolia* and *D. spatulata* in Kyushu, where the two species hybridise. Previously, no *D. tokaiensis* habitat had been reported from Kyushu. The new population, according to the author, has the ability to sexually reproduce and the morphology of *D. tokaiensis*. This may suggest that it is (1) an introduced population, (2) a geographically isolated yet natural population of *D. tokaiensis*, or (3) one that independently emerged by allopolyploidisation.

If (3) is true, there arises a question about whether this new population can be treated as *D. tokaiensis* per se or its subtaxon, because it would share no common F1 hybrid ancestor with *D. tokaiensis* from Honshu and Shikoku. Their F1 hybrid ancestors would have separately originated from paraphyletic/polyphyletic strains of the parent species, namely *D. rotundifolia* and *D. spatulata*, in different regions in different time periods. Additionally, morphology is an important factor in identification of organisms, but whether a morphology-only approach is always sufficient is another question. In any case, further research would be required for this new population.

Lentibulariaceae

Pinguicula macroceras/vulgaris

One of the native *Pinguicula* species from Japan has been identified as *P. macroceras/vulgaris*. Researchers have long disputed over the validity of *P. macroceras* against *P. vulgaris* (Casper 1962; Komiya 1999; Kondo & Shimai 2006; Rice *et al.* 2008; Shimai *et al.* 2021 among many others), and there has been no agreement. In Japan, Komiya (1972) supported *P. vulgaris* L. for the populations from Japan, which Komiya & Shibata (1980) synonymised to *P. vulgaris* L. var. *macroceras* (Link) Herder. Later, Komiya (1999) revised it as *P. macroceras* Link. Recent phylogenetic studies, such as Kondo & Shimai (2006) or Shimai *et al.* (2021), are in favour of those who support *P. macroceras* despite the morphological similarities and diversity. So far, authors in Japan imply that all the local populations pertain to a single species, whether it is *P. macroceras* or *P. vulgaris*.

Pinguicula ramosa (Fig. 5¹²)

P. ramosa is a rare species that is endemic to a confined area of Honshu Island. Habitats of this species are wet cliffs/slopes on the Nikko mountains. Flower scapes of *P. ramosa* can branch 2-3 times, or sometimes more, even though it does produce solitary flowers like other species of the genus.

Previously, Tamura (1953) classified this species as *P. villosa* L. var. *ramosa* (Miyoshi) Tamura. Ernst (1961) synonymised *P. ramosa* as a form of *P. variegata* Turcz. Komiya & Shibata (1998) examined *P. variegata* in Sakhalin, Russia and concluded from the morphology and chromosome

¹² Image use permission statement (in Japanese):
<http://www.nikko-kankou.org/image/index.cfm?action=detail&id=8361>



Figure 5: *Pinguicula ramosa* in the Nikko mountains, Honshu. Photo by Nikkō Kankō Kyōkai.

numbers that *P. ramosa* and *P. variegata* are separate species. Later Shimai (2016) systematically compared *P. ramosa*, *P. variegata*, and *P. villosa* to clarify the differences in the morphology, cytology, and ecology. Both Komiya & Shibata (1998) and Shimai (2016) indicate that the branched flower scapes are one of the distinctive features of *P. ramosa*.

***Utricularia dirmophantha* (Fig. 6)**

U. dimorphantha is a suspended aquatic species that is endemic to Honshu Island. It is found in still or slow-flowing waterbodies such as ponds, lakes, or irrigation ditches where the water is slightly eutrophicated. After habitat loss, this species is only left in limited parts of the island. This



Figure 6: *Utricularia dimorphantha* in cultivation. Photo by Dai Ajiri.

species produces few or no traps, which may suggest that it has evolved while choosing eutrophicated environments to directly intake abundant nutrients from water, instead of having to digest microorganisms (cf. Fleischmann 2011). *U. dimorphantha* produces underwater cleistogamous flowers as well as yellow/cream-coloured opening flowers on areal inflorescences.

Utricularia minor (Fig. 7)

A few infraspecific taxa have been reported from Japan. One of such taxa is *U. minor* Hayne f. *natans* Komiya, which is a free-floating form that lacks undersubstrate stolons (Ishidaka & Kuhara 2007; originally in Komiya 1972). However, further research would be required to elucidate whether all the populations belong to this taxon.

A small terrestrial form is also reported. Komiya (1980) identified it as *U. minor* Hayne f. *terrestris* Glück¹³. The undersubstrate stolons can be absent depending on the population (Ishidaka &

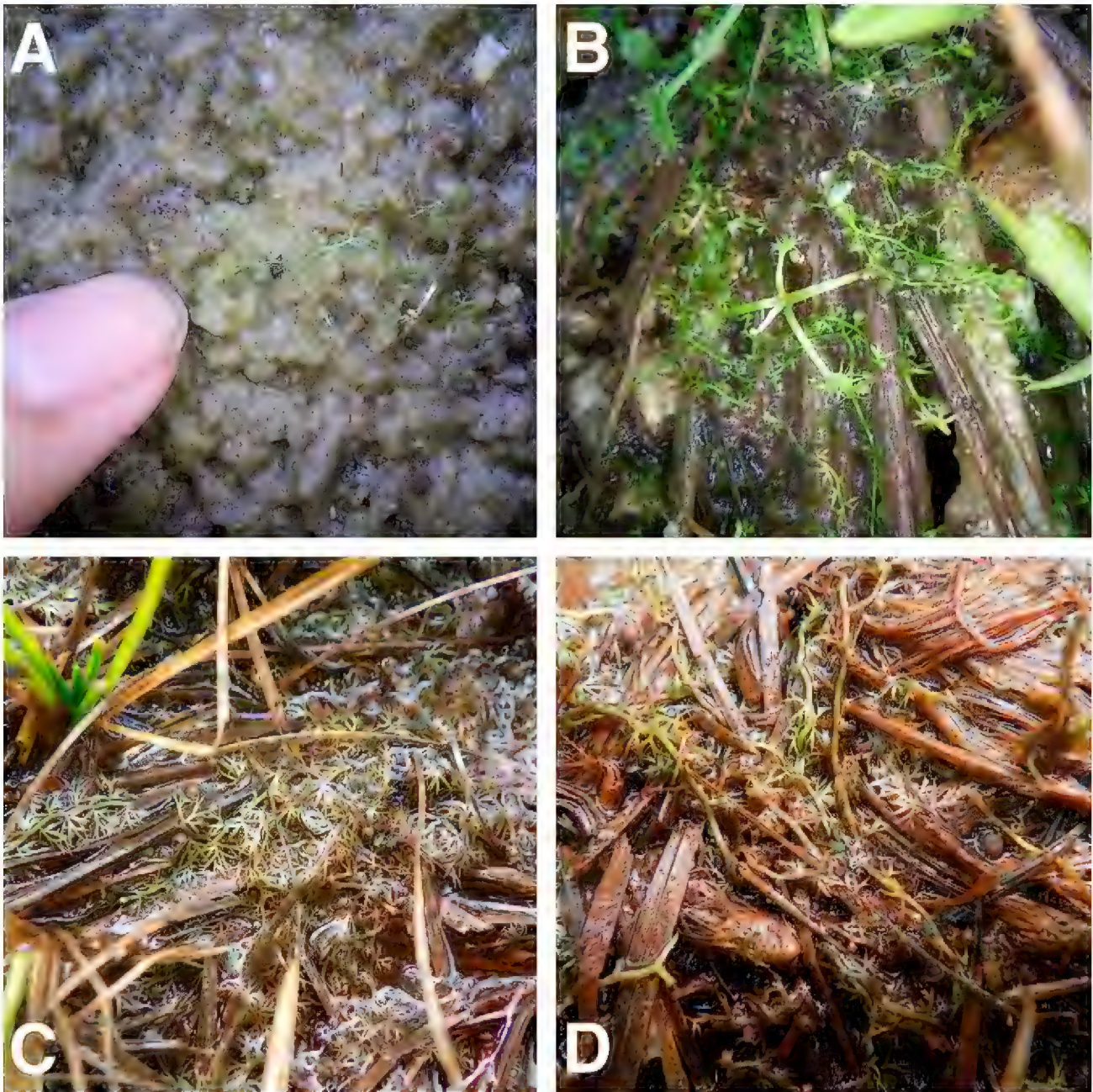


Figure 7: *Utricularia minor* f. *terrestris* in Niigata Prefecture, Honshu. (A-B) A population on a wet cliff. (C-D) A population in a marsh. Photos by Dai Ajiri

¹³ Previously as *U. minor* f. *natans* in Katagiri (1977).

Kuhara 2007). In the Hayade Valley area in Niigata Prefecture, Honshu, it is found on the surface of a wet cliff (Ishidaka & Kuhara 2007; Tsuboya 2008). It is unclear whether all the populations reported as *U. minor* f. *terrestris* pertain to this taxon, not to mention that little has been revealed on the taxon itself in the first place.

Utricularia minutissima

The Japanese range of *U. minutissima* only covers a part of Central Honshu. This is probably a margin of the range of this tropical species reported from Asia and Oceania. In Japan, it was first published by Makino (1906) as *U. nipponica* Makino. The current designation is based on Komiya’s (1980) revision.

Utricularia tenuicaulis

This suspended aquatic species of *Utricularia* has undergone some taxonomic confusion. Makino (1914) described *U. japonica* Makino, from which Miki (1935) separated morphologically distinct *U. tenuicaulis* Miki. Among different taxonomic views, Komiya & Shibata (1980) reclassified *U. japonica* as *U. australis* (f. *australis*) R.Br. and *U. tenuicaulis* as *U. australis* R.Br. f. *tenuicaulis* (Miki) Komiya & Shibata.¹⁴ Later, Kameyama *et al.* (2005) published their finding that *U. australis* f. *australis* from Japan, which is mostly sterile, is a collection of F1 hybrids between *U. australis* f. *tenuicaulis* and *U. macrorhiza* LeConte. Authors such as Yoshida & Takahashi (1994) or Fleischmann (2012) among others thus support *U. tenuicaulis* Miki in Miki (1935) and treat the hybrids as *U. ×australis* R.Br. Kadono (2014), on the other hand, reassigns the name *U. australis* R.Br. to former *U. australis* f. *tenuicaulis*, and *U. ×japonica* Makino to the hybrids.

Carnivorous plant taxa of uncertain distribution in Japan

Droseraceae

***Drosera burmanni* (= *burmannii*) Vahl**

Japan is often included as a part of the range of *D. burmanni* (e.g., Lowrie 2013). However, there has been no record of this species from the nation. In fact, *D. burmanni* is excluded from Komiya & Shibata’s (1978) or Komiya’s (2002) lists of Japanese carnivorous plants.

The most probable hypothesis is that incorrect usage of the name *D. burmanni* L. accounts for this mystery. Makino (1905a) pointed out in his short article that *D. spatulata* (as *D. loureirii*) was commonly referred to as *D. burmanni* L. in Japan. He states in Japanese:

こまうせんごけノ學名ガ能ク間違ヘラレ即チ往々Drosera Burmanni Vahl.ノ名ガ用キ
ラレテアルガコレハ Drosera Loureirii Hook. et Arn. トセネバナラヌ又 Burmanni
Vahl. ハ之レニ似テハ居ルケレドモ全ク別ノ一種デアル

Translation: The botanical name for the Spatulate Sundew is often mistaken: The name *Drosera Burmanni* Vahl. is frequently used, but it should be *Drosera Loureirii* Hook. et Arn. *D. Burmanni* Vahl. resembles it, but it is altogether a different species.

¹⁴ Komiya & Shibata (1980) also recognise the non-floating populations as *U. australis* R.Br. f. *fixa* Komiya, which are likely to be forms of *U. tenuicaulis* from the turion morphology.

Also, Makino (1905b) comments in English as follows:

So far as I know, this species has been found nowhere in Japan, except in Formosa; while *D. spathulate* Labill = *D. Loureirii* Hook. et Arn. (Jap. *Ko-mōsengoke*) are frequently met with. According to Forbes and Hemsley, Carpenter collected it in Amami Ōshima, but we have no specimen of it from there.¹⁵

Other hypotheses include the loss of the population(s) in Japan and the nation's withdrawal from territories in the range of *D. burmanni* (Also see Kagawa 2017).

Lentibulariaceae

Pinguicula villosa L.

According to Hultén (1968), *P. villosa* is found on Shikotan Island, one of Japan's disputed territories with Russia. It is one of the islands that consist the Kuril Islands in the Northeast of Hokkaido Island.

Additional carnivorous plant species from Japan which are unidentified or disputed

Lentibulariaceae

Pinguicula sp.

Komiya & Shibata (1999) comment on an unknown Hokkaido *Pinguicula* species in Ito (1979) as *completely unimaginable*. It is mentioned in Japanese as *Manshū-mushitorisumire*, which translates into *Manchurian Butterwort*. However, no *Pinguicula* species is known to have such a Japanese name. The Flora of China website lists two species, namely *P. alpina* L. and *P. villosa* L., neither of which is reported from Hokkaido Island.

Utricularia siakujiiensis S.Nakaj. (Fig 8.)

Sadao Nakajima (as his affiliation Tōkyōfu Dobokubu 1937) described a suspended aquatic species of *Utricularia* from Sanpoji Pond in Tokyo, which is currently a part of Toritsu Shakujii Kōen, a municipal park. The population was lost due to pollution during the urbanisation of the local area, and there has been no sign of revival. Authors propose different hypotheses on the identity of this mystery *Utricularia*.

Komiya & Shibata (1980) treated this *Utricularia* population as *U. australis*, which later turns out in Kameyama *et al.* (2005) to be hybrids between *U. tenuicaulis*¹⁶ and *U. macrorhiza*. Komiya (2014) then synonymised *U. siakujiiensis* to *U. australis* sensu Kadono (2014), namely *U. tenuicaulis* sensu Miki. Kadono & Tanaka (2015) examined the herbarium specimens and argue that it is *U. macrorhiza*, a circumboreal species¹⁷. It would be no surprise if a circumboreal *Utricularia* species were found in Tokyo, because this region has waterbodies sourced by cool spring water. Sanpoji Pond is one of such waterbodies, which has retained Ice Age relicts such as *Menyanthes trifoliata* L. (Menyanthaceae).

¹⁵ All the spellings are as in the original.

¹⁶ As *U. australis* f. *tenuicaulis* in the original study.

¹⁷ There had been no report of *U. macrorhiza* from Japan until Komiya (1994).



Figure 8: A turion of *Utricularia* sp. originally from Sanpoji Pond, which is most likely to be *U. tenuicaulis* (from Toritsu Shakujii Kōen 2022).

A local school’s old biotope has recently drawn attention for having a species of *Utricularia* from Sanpoji Pond. According to the PR of Toritsu Shakujii Chūgakkō (2018a, 2018b, 2018c, 2018d), a local junior high school, their biotope was set up in 1959 by some of the teachers and students by laying local rice field soil as the substrate and then introducing plants collected from Sanpoji Pond. The school notes that the students from the period observed the carnivory action of the *Utricularia* species with a microscope and consulted a guidebook for identification. Recently, Toritsu Shakujii Kōen’s (2022) staff posted online a turion photograph of the *Utricularia* species from the school biotope. The brown-coloured turion that is slightly elongated lengthwise suggests that it is *U. tenuicaulis*, which the park staff also claims in the post, even though there is no concrete evidence that this is exactly what Nakajima published.

***Utricularia* sp. (Fig. 9)**

Miyamoto (2021a, 2021b, 2021c) noticed a population of an unidentified *Utricularia* species in Hyogo Prefecture, Honshu and described the characteristics in his notes. This may be a form of *U. gibba/exoleta* or a closely related species, as far as I understand his notes and personal communication (Miyamoto, Makoto. July 2023) on the morphology. It resembles *U. minor* and partially grows within the substrate. The main stems produce thread-like shoots during summer. These thread-like shoots reach the water surface, are easily detached, and can have a trap near the apex. The detached thread-like shoots continue growth as independent plants. No turions are formed for winter. The flowers are yellow, and the lower lip is horizontal with the middle area raised, and the upper lip is curled.

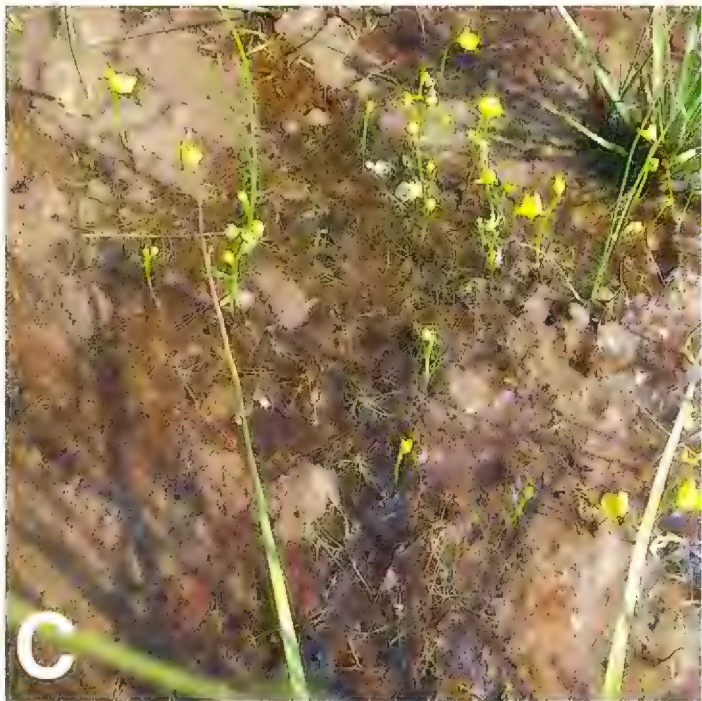


Figure 9: (A-B) Plants and a flower of the unidentified *Utricularia* species (from Miyamoto 2021c). (C) The plants *in situ* with thread-like shoots floating under the water surface, co-existing with *U. bifida*. Photo by Makoto Miyamoto. (D) A cluster of plants. Photo by Dai Ajiri.

Miyamoto remarks that the plants in cultivation appear as typical *U. gibba/exoleta* despite the behaviour *in situ*. He theorises that the thread-like shoots are for dispersal and asexual multiplication, and that the plants produce them in order to remain near the water surface without the entire plants being buried into the sediment and substrate. The thread-like shoots detach while he attempts to prepare a herbarium specimen with them connected to the main plants (Miyamoto, Makoto. July 2023. Personal communication.).

Tofieldiaceae

Triantha japonica (Miq.) Baker (Fig. 10)

T. japonica is a Honshu-endemic monocot that is found in mountain wetlands. It often co-occurs with carnivorous plant species such as *Drosera rotundifolia*. The leaf blades are basal, linear, erect, and up to 40 cm in length. In summer it produces erect inflorescences, which are up to 40 cm long, with a scape covered with mucilaginous hairs. The flowers are white and approx. 1 cm across, which can be partially red. The mucilage secretion is weaker than in other carnivorous plant genera such as *Drosera*, and therefore it is only functional as a trap when the contact area is large enough for the size and/or physical strength of the prey.



Figure 10: *Triantha japonica* in cultivation. (A) A plant in bloom. (B) A closeup of a flower scape. Photos by Takaaki Kagawa.

Lin *et al.* (2021) reported carnivory in *T. occidentalis* (S. Watson) R.R. Gates. Flower scapes of *T. occidentalis* have mucilaginous hairs to capture and digest small insects, according to the authors. *T. japonica*, like its North American carnivorous sister, has also been known to trap insects on the flower scapes, even though it is yet to be investigated for carnivory.¹⁸ Japanese names for this species include *Mushitorizekishō*, which translates into *Bug-catching Acorus*.

Conclusion

We listed Japanese-native carnivorous plant species and hybrids after Komiya (2002) and discussed selected species and hybrids within the list. We also reviewed unidentified species which are out of the list as well as taxa of unconfirmed distribution in the country. Finally, we reviewed a potentially carnivorous monocot based on recent research (Lin *et al.* 2021).

Acknowledgements: I would like to thank Dai Ajiri, Makoto Miyamoto, Takeru Okamoto, and Masaaki Senda for the wonderful photographs, and Makoto Miyamoto for providing information.

References

- Böcher, T.W., Holmen, K., and Jakobsen, K. 1968. The Flora of Greenland (English edition). Copenhagen: P. Haase & Son Publishers.
- Casper, S.J. 1962. On *Pinguicula macroceras* Link in North America. *Rhodora*. 64: 212-221.
- Coritico, F.C., and Fleischmann, A. 2016. The first record of the boreal bog species *Drosera rotundifolia* (Droseraceae) from the Philippines, and a key to the Philippine sundews. *Blumea* 61(1): 24-28. <https://doi.org/10.3767/000651916X691330>
- Fleischmann, A. 2011. Do we have any evidence that any plants have given up carnivory? *Carniv. Pl. Newslett.* 40(1): 37. <https://doi.org/10.55360/cpn401.af292>
- Fleischmann, A. 2012. The new *Utricularia* species described since Peter Taylor's monograph. *Carniv. Pl. Newslett.* 41(2): 67-76. <https://doi.org/10.55360/cpn412.af309>
- Fleischmann, A. 2021. On tropical *Drosera rotundifolia* L. *Carniv. Pl. Newslett.* 50(1): 7-15. <https://doi.org/10.55360/cpn501.af850>
- Flora of China. FOC Vol. 19 Page 480.
http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=125513 (Accessed: 27 July 2023).
- Hayakawa, H., Hamachi, H., Ogawa, K., Minaniya, Y., Yokohama, J., Arakawa, R., and Fukuda, T. 2012. New records of *Drosera tokaiensis* subsp. *hyugaensis* (Droseraceae) from Kochi Prefecture, Japan. *Botany* 90(8): 763-769. <https://doi.org/10.1139/b2012-036>
- Hultén, E. 1968. *Flora of Alaska and Neighboring Territories: A Manual of the Vascular Plants*. Stanford: Stanford University Press.
- Ichihashi, Y., Hattori, K., and Minami, M. 2006. Tōkai kyūryō yōso shokubutsu gunraku no hozenseitaigaku-teki kenkyū - Hozen/shūfuku to sono kanri ni kansuru kenkyū - (4) Mōsengokezoku (*Drosera*) no shu tayōsei to bunshikeitōgaku-teki kenkyū ni tsuite. *Seibutsukinō Kaihatsu Kenkyūjo Kiyō* 6: 67-84.
- Ishidaka, K., and Kuhara, T. 2007. Niigataken ni jisei suru suisei tanukimo-rui no bunpu (sono 1). *Niitsu Shokubutsu Shiryōshitsu Nenpō* 2006: 32-37.

¹⁸ Lin (2020) notes that *T. japonica* should be treated as synonymous to *T. occidentalis*, based on his plastid gene analysis.

- Ito, K. 1979. Hokkaidō no deitanchi to shitsugenshokubutsu. *Shokubutsu to Shizen* 13(12): 16-20. Japan Meteorological Agency. General Information on Climate of Japan.
<https://www.data.jma.go.jp/gmd/cpd/longfcst/en/tourist.html> (Accessed: 29 July 2023).
- Kadono. 2014. *Neichā Gaido Nihon no Mizukusa*. Tokyo: Bun'ichi Sōgō Shuppan.
- Kagawa, T. 2017. *Drosera* of Japan (Second Edition). London: WriteHit.com. (With additions to the original 2014 publication)
- Kameyama, Y., Toyama, M., and Ohara, M. 2005. Hybrid origins and F1 dominance in the free-floating, sterile bladderwort, *Utricularia australis* f. *australis* (Lentibulariaceae). *American Journal of Botany* 92(3): 469-476. <https://doi.org/10.3732/ajb.92.3.469>
- Katagiri, Y. 1977. Niigataken no shokuchūshokubutsu tsuiho. *J. Insect. Soc.* 80: 1-7.
- kokebohusi. 2012. Mōsengoke momobana (*D. rotundifolia*).
<http://nemurinuma.blog2.fc2.com/blog-entry-35.html> (Accessed: 16 July 2023).
- kokebohusi. 2013. 2013 Momobana. <http://nemurinuma.blog2.fc2.com/blog-entry-42.html> (Accessed: 16 July 2023).
- Komiya, S. 1972. Systematic Studies on the Lentibulariaceae. Dissertation. Department of Biology, Nippon Dental College.
- Komiya, S. 1989. *Aldrovanda vesiculosa* L. (Droseraceae) and its last natural habitat, Hozoji Pond. *Bull. Nippon Dental Univ. Gen. Educat.* 18: 97-143.
- Komiya, S., and Shibata, C. 1978. Distribution of the Droseraceae in Japan. *Bull. Nippon Dental Univ. Gen. Educat.* 7: 167-205.
- Komiya, S., and Shibata, C. 1998. Exploration for the carnivorous plants in Sakhalin. *Bull. Nippon Dental Univ. Gen. Educat.* 27: 141-165.
- Komiya, S. 1994. *Shokuchūshokubutsu Sono Fushigi wo Saguru*. Tokyo: Shokken Jigyō Shuppan.
- Komiya, S. 1999. Japanese *Pinguicula* (Lentibulariaceae). *Bull. Nippon Dental Univ. Gen. Educat.* 28: 117-146.
- Komiya, S. 2002. Carnivorous plants mentioned in each prefecture of Japan. *Bull. Nippon Dental Univ. Gen. Educat.* 31: 135-165.
- Komiya, S. 2014. Shakujiitanukimo no tenmatsuki. *J. Insect. Soc.* 65: 33-37.
- Komiya, S., and Shibata, C. 1978. Distributions of the Droseraceae in Japan. *Bull. Nippon Dental Univ. Gen. Educat.* 7: 3-79.
- Komiya, S., and Shibata, C. 1980. Distribution of the Lentibulariaceae in Japan. *Bull. Nippon Dental Univ. Gen. Educat.* 9: 161-212.
- Kondo, K., and Shimai, H. 2006. Phylogenetic analysis of the northern *Pinguicula* (Lentibulariaceae) based on Internal Transcribed Spacer (ITS) sequence. *Acta Phytotax. Geobot.* 57(2):155-164. <https://doi.org/10.18942/apg.kj00004622859>
- Ksepka, J. 2022. *Drosera filiformis* Raf. var. *floridana* Rice forma *albiflora* J.Ksepka f. nov. *Carniv. Pl. Newslett.* 51(2): 92-94. <https://doi.org/10.55360/cpn512.jk874>
- Lin, Q. 2020. Phylogenetics and evolution of monocot mycoheterotrophs and a newly demonstrated lineage of carnivorous monocots. Dissertation. University of British Columbia.
- Lin, Q., Anéc, C., Givnish, T.J., and Grahama, S.W. 2021. A new carnivorous plant lineage (*Triantha*) with a unique sticky-inflorescence trap. *The Proceedings of the National Academy of Sciences* 118(33): e2022724118. <https://doi.org/10.1073/pnas.2022724118>
- Makino, T. 1893. Notes on Japanese Plants, XIX. *The Botanical Magazine* 7(80): 285-286, plate 11.
- Makino, T. 1905a. Komōsengoke no gakumei. *The Botanical Magazine* 19: 13-14.

- Makino, T. 1905b. Observations on the flora of Japan. The Botanical Magazine 19: 6-30. (a part of a series)
- Makino, T. 1906. Observations on the flora of Japan. The Botanical Magazine 20: 95-96. (a part of a series)
- Makino, T. 1914. Observation on the flora of Japan. The Botanical Magazine 28: 20-30. (a part of a series)
- Miki, S. 1935. New water plants in Asia Orientalis III. The Botanical Magazine 49(586): 847-852.
- Miyamoto, M. 2021a. Shinshu no tanukimo hakken ka?
<https://syokutyutansakukai.amebaownd.com/pages/5037005/STATIC> (Accessed: 30 July 2023).
- Miyamoto, M. 2021b. Kinkyō. <https://syokutyutansakukai.amebaownd.com/pages/5056047/STATIC> (Accessed: 30 July 2023).
- Miyamoto, M. 2021c. Shinshu happyō Harimatanukimo to meimei.
<https://ipes.amebaownd.com/pages/5370340/STATIC> (Accessed: 30 July 2023).
- Nakamura, T. 1993. A new natural hybrid between *Drosera spathulata* and *D. tokaiensis*. Acta Phytotaxonomica et Geobotanica 44(1): 77.
- Nakamura, T., and Ueda, K. 1991. Phytogeography of Tōkai Hilly Land Element: II. Taxonomic study of *Drosera tokaiensis* (Komiya & C. Shibata) T. Nakamura & Ueda (Droseraceae). Acta Phytotax. Geobot. 42(2): 125-137.
- Nishihara, S., Shiga, T., and Nishihiro, J. 2023. The discovery of a new locality for *Aldrovanda vesiculosa* (Droseraceae), a critically endangered free-floating plant in Japan. Journal of Asia-Pacific Biodiversity 16(2): 223-277. <https://doi.org/10.1016/j.japb.2023.03.013>
- 都立石神井公園 [Toritsu Shakujii Kōen]. @ParksSyakujii. 28 October 2022. 【見ごろの生き物】サービスセンターロビーでイヌタヌキモの展示を始めました 🐾❤️
 捕虫囊でミジンコ等を捕える食虫植物で、昔三宝寺池から石神井中学校へ株分けされたものを展示用に頂きました。
 現在越冬芽も見られます!!ぜひご覧ください 🔍
 #石神井公園 #石神井公園自然図鑑
<https://twitter.com/ParksSyakujii/status/1585813609602392066> (Accessed: 25 July 2023).
- Rice, B., Yin, A., and Morimoto, G.E. 2008. Observations of isolated *Pinguicula* populations in the western USA. Carniv. Pl. Newslett. 37(4): 100-109. <https://doi.org/10.55360/cpn374.br482>
- Rice, B. 2018. *Utricularia* section *Utricularia*. <http://www.sarracenia.com/faq/faq5666.html> (Accessed: 17 July 2023).
- Robinson, A., Fleischmann, A., and Nunn, R. 2017. *Drosera* of Asia. In: Robinson, A. (ed.). *Drosera* of the World vol. 2 – Oceania, Asia, Europe, North America. Poole: Redfern Natural History Productions.
- Seno, J. 2003. A new natural hybrid of *Drosera* (Droseraceae) from Miyazaki Prefecture, Southwestern Japan. Journal of Japanese Botany 78(3): 170-174.
- Shimai, H. 2016. *Pinguicula ramosa* Miyoshi – A botanical review. Carniv. Pl. Newslett. 45(2): 51-68. <https://doi.org/10.55360/cpn452.hs667>
- Schlauer, J., Hartmeyer, S.R., and Hartmeyer, I. 2019. Quinone patterns and identification of Japanese Spider Leg Sundews (*Drosera* Sect. *Arachnopus*). Carniv. Pl. Newslett. 48(4): 161-163. <https://doi.org/10.55360/cpn484.js448>
- Tamura, M. 1953. Key to the insectivorous plants of Japan. Acta Phytotaxonomica et Geobotanica 15(1): 31.

Taylor, P. 1989. The genus *Utricularia*: a taxonomic monograph (Kew Bulletin Additional Series XIV). London: Her Majesty's Stationary Office.

Tōkyōfu Dobokubu. 1937. Musashino no shokubutsu. Tōkyō Ryokuchi Keikaku Chōsa Ihō 9: 1-126.

Toritsu Shakujii Chūgakkō. 2018a. [Hakken] Shakujii Chūgakkō ni wa shokuchūshokubutsu ga seisoku shite iru 1. https://cms.nerima-tyo.ed.jp/weblog/index.php?id=219&type=1&column_id=139096&category_id=6617&date=20180605 (Accessed: 25 July 2023).

Toritsu Shakujii Chūgakkō. 2018b. [Hakken] Shakujii Chūgakkō ni wa shokuchūshokubutsu ga seisoku shite iru 2. https://cms.nerima-tyo.ed.jp/weblog/index.php?id=219&type=1&column_id=139190&category_id=6617&date=20180605 (Accessed: 25 July 2023).

Toritsu Shakujii Chūgakkō. 2018c. [Hakken] Shakujii Chūgakkō ni wa shokuchūshokubutsu ga seisoku shite iru 3. https://cms.nerima-tyo.ed.jp/weblog/index.php?id=219&type=1&column_id=139719&category_id=6617&date=20180605 (Accessed: 25 July 2023).

Toritsu Shakujii Chūgakkō. 2018d. [Hakken] Shakujii Chūgakkō ni wa shokuchūshokubutsu ga seisoku shite iru (saishūkai). https://cms.nerima-tyo.ed.jp/weblog/index.php?id=219&type=1&column_id=139757&category_id=6617&date=20180605 (Accessed: 25 July 2023).

Tsuboya, T. 2008. Chibihimetanukimo no seiikuchi. Niitsu Shokubutsu Shiryōshitsu Nenpō 2007: 14.

Watanabe, M., Serizawa, S., and Owada, M. 2013. Nagabanoishimochisō akabana-gata to shirobana-gata no identeki/keitateki bunka. Shidekobushi 2(2): 57-64.

Watanabe, M. 2014. Nihon-koyū no shinshu! Toyoake no nagabanoishimochisō kara wakaruseibutsu-tayōsei –Yūmei na shokubutsu mo igai ni wakatte inai–. http://www.aichi-edu.ac.jp/intro/files/rikakyoiku_watanabemikio_140312.pdf (Accessed: 16 July 2023).

Yoshida, F., and Takahashi, H. 1994. Notes on *Utricularia tenuicaulis* MIKI (Lentibulariaceae) & *Potamogeton berchtoldii* FIEBER (Potamogetonaceae) found from Atsugi City. Kanagawa Shizenshi Shiryō 15: 67-70.

Carnivorous Plant Nursery

Promoting environmental stewardship through
engaging educational materials and high-quality carnivorous plants.



- Cephalotus
- Heliamphora
- Darlingtonia
- Genlisea
- Bromeliads
- Live Sphagnum Moss
- Bog Orchids, Bog Plants, Seeds

www.cpnursery.com

301-824-0133 | info@carnivorousplantnursery.com | 13763 John Cline Road, Smithsburg, MD 21783

THE 13TH ICPS POST-CONFERENCE TOUR TO THE GREATEST BOTANICAL GARDENS OF HYOGO PREF., JAPAN

EMMI KUROSAWA • Massachusetts • USA • emi.kurosawa@gmail.com

Keywords: ICPS Conference, tour, Japan

Received: 21 July 2023

<https://doi.org/10.55360/cpn524.ek100>

Abstract: The 13th ICPS Post-Conference Tour visited the Tegarayama Conservatory Botanical Gardens and the Hyogo Prefectural Flower Center, Japan.

Thanks to the immeasurable effort and leaderships of Naoki Tanabe (Japanese Carnivorous Plant Society (JCPS) president), Koji Kondo (Kansai (K) CPS), Ako Minami (KCPS), and staff from Japanese CPS, Kansai CPS, Tokai CPS, and Hiroshima CPS, the 13th ICPS Conference was a huge success to say the least. After each ICPS conference, it has been a tradition to have a few field trips and was not an exception after this year's conference in Himeji, Japan. The city of Himeji is a historical castle city in Hyogo Prefecture and proudly hosts the magnificent Himeji Castle, one of the World Heritage Sites. But that wasn't the destination for us, the CP bunch! Instead, we absolutely wanted to visit two of the greatest botanical gardens in Hyogo where some of the largest CP collections in the world awaited us. My role here was to be one of the English-Japanese interpreters and help non-Japanese visitors navigate during the tours.

The first place to visit on the first day after the conference was the Himeji City Tegarayama Conservatory Botanical Gardens (Fig. 1). Seventy-four of us got on two full sized charter buses at the JR Himeji station and enjoyed the scenic local roads to the conservatory. At the Tegarayama conservatory, we were welcomed by Takeshi Asai, the vice president of the conservatory, who guided us around the place with his friendly smiles (Fig. 2).

One of the special exhibitions they had was a collection of plants which Tomitaro Makino, the renowned Japanese botanist from the early 1900's, discovered and named. *Aldrovanda vesiculosa* was on display here because Makino discovered the first population in Japan and gave the Japanese name "Mujinamo". "Mujina" is an old Japanese word for an animal called "Tanuki" (*Nyctereutes*



Figure 1: Conservatory domes of the Tegarayama Botanical Garden. Photo by Koji Kondo.



Figure 2: Mr. Asai in one of the backyard greenhouses at the Tegarayama Conservatory Botanical Gardens.

procyonoides) which resembles a racoon. As the Japanese name “Tanukimo” for the aquatic *Utricularia*, *Aldrovanda* got this name because it resembles the bushy tail of “Tanuki”. “Mo” means an aquatic plant. This population was in a pond by the Edo River in the town of Koiwa in Tokyo where I grew up (and I am very proud of this fact!). Unfortunately, but not surprisingly, this population is long gone. There is, however, a nice monument there indicating it as the first *Aldrovanda* site in Japan discovered by Makino. In addition to the *Aldrovanda*, *U. tenuicaulis*, *U. gibba*, and *U. vulgaris* var. *japonica* were also exhibited (Fig. 3).

At Tegarayama, they had two main greenhouse domes, one of which was the Desert plant dome where they displayed a huge array of cacti and succulents. We then walked through a path of rock gardens to the backyard greenhouse area. The backyard greenhouses were the best places in Tegarayama gardens, because they were packed with so many beautiful and interesting Japanese hybrids that we don’t see elsewhere in the world (Fig. 4).

The path from the lower backyard cultivation area to the second greenhouse, the upper tropical dome, was decorated with red, green, yellow, and white, a colorful kaleidoscope of *Sarracenia*. We were all wowed by the unique collections of *Nepenthes* and *Sarracenia* and took pictures



Figure 3: Aquatic carnivorous plants of Japan. (A) *Aldrovanda vesiculosa*, (B) *Utricularia vulgaris* var. *japonica* (*U. tenuicaulis* × *macrorhiza*), (C) *U. tenuicaulis*, and (D) *U. gibba* at the Himeji City Tegarayama Conservatory Botanical Gardens.



Figure 4: *Nepenthes* Japanese hybrids. (A) *Nepenthes*. $\times$ *toyoshimae*, (B) *N.* $\times$ *shamenbana*, and (C) *N.* $\times$ *mastershiana* var. *purpurea* at the Himeji City Tegarayama Conservatory Botanical Gardens.

frantically! The upper tropical dome hosted a massive *N. truncata*, Japanese *Nepenthes* hybrid “Koto” series, some *Pinguicula* spp., *Catopsis berteroniana*, *U. gibba*, and more. At the end of the tour, Mr. Asai surprised us with a little packet of giveaways which contained the Tegarayama tour map, a CP postcard, and several note cards of the white egret flower (*Pecteilis radiata*), the symbolic flower of Himeji city. It was now time to move onto the next destination, the Hyogo Prefectural Flower Center.

The guide waiting for us at the Hyogo Flower Center was Masahiro Doi, the master CP horticulturist of Japan (Fig. 5). He is probably one of the most renowned horticulturists in the world who contributed to the advancement of horticulture of CPs. In his magic hands, the 55.5 cm giant *N. truncata* pitcher made the Guinness record in August 2022. The notoriously difficult to grow, c. 33-year-old female *N. pervillei* (Fig. 6) has made so many novel hybrids which include *N. pervillei* $\times$ *madagascariensis*, *N. pervillei* $\times$ *ventricosa*, *N. pervillei* $\times$ *khasiana*, *N. pervillei* $\times$ *thorelii*, *N. pervillei* $\times$ “Etcetera”, etc. The female *N. clipeata* has produced many pedigree *N. clipeata* offspring, introducing the new genetic variations to the cultivated population of critically endangered *N. clipeata*. He has also made countless breathtakingly beautiful *Sarracenia* hybrids such as *S.* $\times$ “Hinomaru”, *S.* $\times$ “Salad Girl”, *S.* $\times$ “Big White”, *S.* $\times$ “Beni Ageha”, just to name a few. Before the tour, Master Doi led us to a lovely lunch at the café Fleuri located within the Flower Center. We were again welcomed with surprise gifts from the Flower Center which included a map of the Flower Center and a writing board with pictures of CPs. We were served delicious local delicacies, each dish presented like an art piece in a



Figure 5: Master Doi (right) and the author (left) at the Hyogo Prefectural Flower Center.

Japanese classic “Kaiseki” style bowl. After lunch we visited the long-awaited “Carnivorous Plant Room”. There was a pathway to the Carnivorous Plant Room beautifully decorated by gorgeous *Nepenthes* and other CPs and some orchids. We were completely mesmerized by the number, size, and the color of them! We were totally affixed there even before we got to the main Carnivorous Plant exhibition. The Carnivorous Plant Room was one of a kind and a single word could not describe the scale and the beauty of it (Fig. 7).

The entrance to the room was decorated by arches of hanging pitchers of *N. reinwardtiana*, *N. × mastersiana*, *N. khasiana*, *N. × “Etcetera”*. At the base of them was the Guinness record breaking *N. truncata* (Fig. 8). The pitcher which broke the record last year has been preserved and stored away, but new pitchers on the mother plant were growing big enough to break its own record in the near future! Past the giant *N. truncata* was the 33-year-old majestic female *N. pervillei* sitting like a queen on a throne proudly shooting up her inflorescence like a crown (Fig. 6). Under the tender and loving care of Master Doi, female *N. pervillei* has produced the above-mentioned numerous offspring in the past and is ready for more!

The Flower Center has another interesting *Nepenthes*. They originally came from Java years ago. They looked like *N. reinwardtiana* without the “eyes” and came with a green form and a red form, which Master Doi says has not yet been properly identified (the large *Nepenthes* in the center of Fig. 7).

The last but not the least place to see was the backyard. The backyard was like Master Doi’s lab where he propagates numerous *Nepenthes*, *Sarracenia*, *Drosera*, and more and creates



Figure 6: *Nepenthes pervillei*.



Figure 7: The Carnivorous Plant Room, looking from the back end at the Hyogo Prefectural Flower Center.

unique hybrids from them. Two main greenhouses hosted back-up *Nepenthes* which were just as impressive as the ones on exhibition, and Master Doi's countless *Nepenthes* seedlings. In between and at the back of the two greenhouses was a carpet of colorful *Sarracenia* species and hybrids (Fig. 9).

Master Doi carefully inspects every single one of the CPs every single day here at the Flower Center. He often picks up a pot and describes the characteristics of the clone with his lovely "Kansai" (Southwestern Japan) accent, "Emmi chan, this girl (a young *Nepenthes*) is an interesting one. See, the pitcher is red right now, unusual for the species. But when she grows bigger, these pitchers start losing the red, but the back of the lid would stay red. Isn't it fascinating?". He describes it with such affection and passion as if "she" is one of his own daughters. With his ever-lasting curiosity, Master Doi sent us a message at the end of the tour. "I found *N. pervillei* literally "sweat". You often see white deposits over the petioles. I licked them, and they were salty! I hope that someday some of you can find out what it is and why *N. pervillei* do that." Perhaps someone will have the answers for him by the next time we visit him. Thank you, Mr. Asai and the staff at the Tegarayama Conservatory, and Master Doi and the Hyogo Prefectural Flower Center for all the hard work you put into the success of this tour! Take care until we see you again!



Figure 8: Newly forming pitcher of the *Nepenthes truncata* whose pitcher made the Guinness record in height (55.5 cm) last year at the Hyogo Prefectural Flower Center.

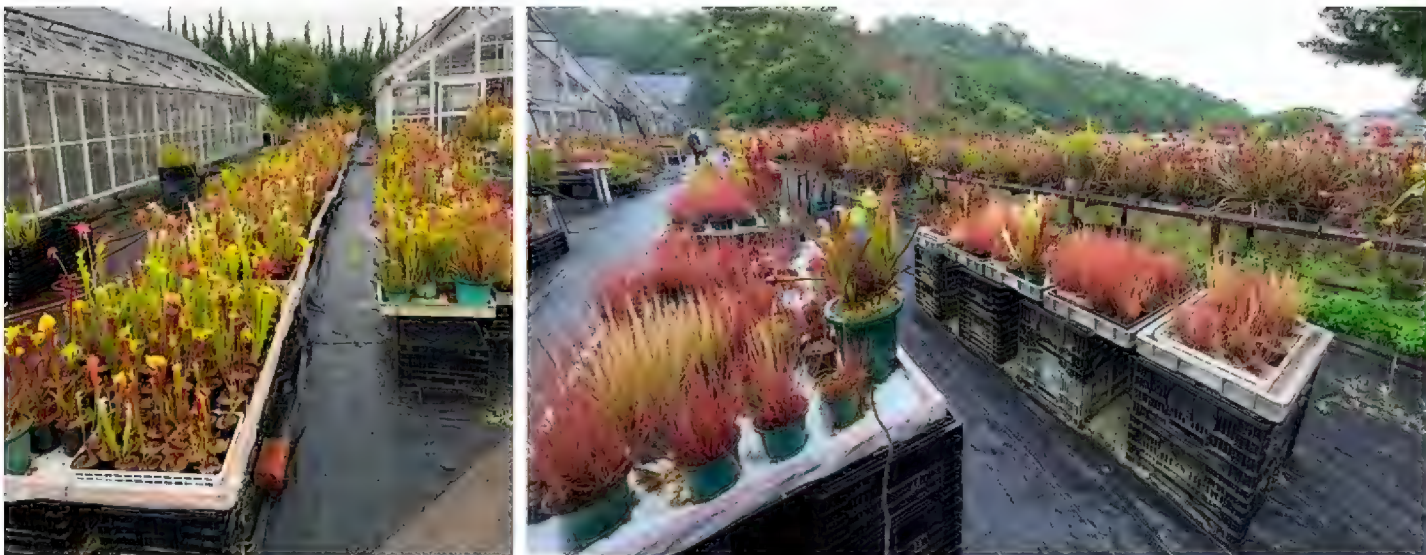


Figure 9: *Sarracenia* species and hybrids in the backyard of the Hyogo Prefectural Flower Center.

THE 13TH ICPS POST-CONFERENCE WETLAND EXPEDITIONS

JUSTIN DUNNING • Brentwood Bay • Canada • canadiancarnivorousplants@gmail.com

Keywords: ICPS Conference, tour, Japan

Received: 8 August 2023

<https://doi.org/10.55360/cpn524.jd088>

Abstract: The 13th ICPS Post-Conference tour visited two areas to observe *Drosera rotundifolia*, *Drosera tokaiensis*, *Drosera*. aff. *spatulata*, and masses of *Drosera lunata*.

Following the field trips to Tegrayama Botanical Garden and Hyogo Prefectural Flower Center, 45 conference attendees set out on 30 May 2023 to visit two natural sites teeming with carnivorous plants in Kato City and Taka Town, a short distance from Himeji.

Seeing native carnivorous plants in their habitat is a highlight for any naturalist and the long-time tradition of field trips after an ICPS conference was what many conference attendees look forward to the most. Japan has an abundance of carnivorous plants with 2 species of *Pinguicula*, around 6 species of *Drosera*, around 10 species of *Utricularia*, and *Aldrovanda vesiculosa*. Given how widely spread they are across a large country and the restrictions on some of the more sensitive species sites, we were lucky to observe a diversity of Japanese carnivorous plants in their habitat.

I had been in contact with Koji Kondo in the months approaching the conference and expressed interest in seeing a variety of orchids and carnivorous plants. Koji was kind enough to not only provide insight into where some of these plants grew but offered to personally guide my friend and I to these sites before the start of the conference. Koji had been to some of the potential ICPS field trip sites that spring and two of them were excluded for being too small for a large group of people. We visited these two sites along with other orchid sites and got to observe *Drosera lunata*, *Drosera tokaiensis*, *Drosera* aff. *spatulata*, *Drosera rotundifolia*, and a variety of *Utricularia*. Having now visited these sites, I can understand why they were excluded from the ICPS field trips. One site would have only accommodated half a dozen people at a time and the other was limited to a single thin boardwalk of logs, hardly enough for 45 people to explore (Fig. 1). This sneak peek into what was to come only got me more excited for the next two field trips.

The first site on the official ICPS field trip was a 45-minute bus ride from Himeji to Kato and the group was split into two buses. The *Pinguicula ramosa* field trip was over 700 km away which meant that half of our group



Figure 1: Koji and Justin on the boardwalk of the excluded site. Photo by Neil Baskerville-Bridges.



Figure 2: *Drosera lunata* at Kato site.

needed to leave immediately after these field trips and were put onto a single bus so our tight schedule could be maintained. After arriving, we had a 500 m walk up to the site where we got to observe *D. rotundifolia*, *D. tokaiensis*, *D. aff. spatulata*, and masses of *D. lunata* (Fig. 2 & 3A-B). Having spent a huge portion of my life searching for carnivorous plants in Canadian bogs dominated by *Sphagnum* sp., I was surprised at how dry the site appeared to be and how the plants grew in predominantly sandy areas with seeps hydrating them. It was also interesting to see how the *D. lunata* grew at a higher elevation at the site and the more moisture dependent species grew lower in the seeps. Our Japanese guide also pointed out how the *D. aff. spatulata* and *D. tokaiensis* grew tucked into the surrounding plants to protect them from cold snaps while the *D. rotundifolia* were happy to grow in more exposed areas where frost was more likely to occur. After an hour of exploring, we headed back to the bus and onto our next destination.

After a short 30-minute bus ride and a stop for lunch, we were at the next site. This site was

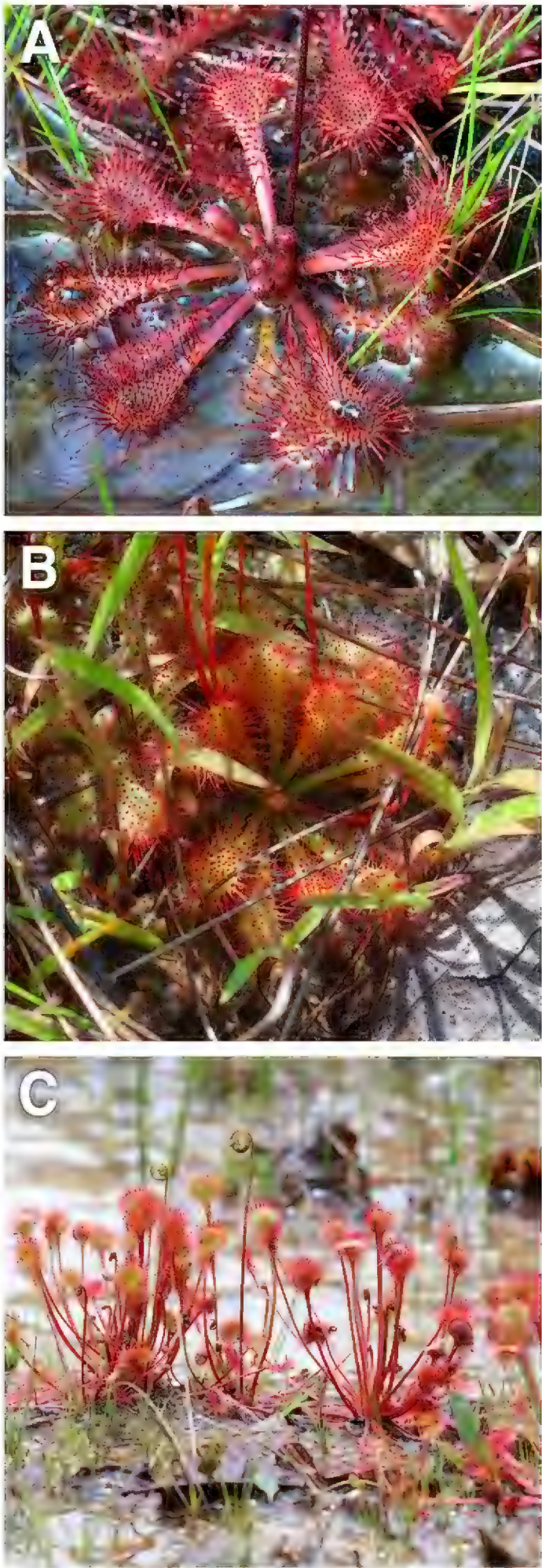


Figure 3: (A) *Drosera tokaiensis* at Kato site. (B) *D. aff. spatulata* at Kato site. (C) *D. rotundifolia* at Taka site.

a beautiful wetland with a seeping slope that transitioned into a marsh-like habitat dominated by sedges. The first plants on the driest parts of the slope were a small patch of *D. lunata* which quickly transitioned into a much wetter area packed with *D. tokaiensis* and *D. rotundifolia* (Fig. 3C). As the wetland expanded towards a small lake, species of both aquatic and terrestrial *Utricularia* were growing and accompanied by *Pogonia japonica* in perfect flower. Although we were too early to observe any of the *Utricularia* in flower it was still a highlight for many in our group. Unlike the previous site which was just *Drosera* and several interesting invertebrates, this site was teeming with wildlife. Frogs, a variety of dragonflies, a seemingly unbothered turtle, and a wide array of other plants were some of the highlights. After an hour and a half of exploring the wetlands, our group said goodbye to the plants and headed back to Himeji so the *P. ramosa* explorers could catch their train to Tokyo (Fig. 4).

I would like to thank the Japanese carnivorous plant societies for hosting this wonderful conference, even after dealing with multiple postponements, and for inviting us to experience your amazing country. I would also like to thank Koji Kondo for taking the time to show me around some fascinating sites. And thank you to Emmi Kurosawa for her group organization, and to all the conference attendees who made this conference possible.



Figure 4: Our group at the Taka site. Photo by Neil Baskerville-Bridges.

THE 13TH ICPS CONFERENCE *PINGUICULA RAMOSA* EXPEDITION

EMMI KUROSAWA • Massachusetts • USA • emi.kurosawa@gmail.com

Keywords: ICPS Conference, tour, *Pinguicula ramosa*, Mt. Nyoho, Japan

Received: 21 July 2023

<https://doi.org/10.55360/cpn524.ek111>

Abstract: The 13th ICPS Post-Conference tour climbed Mt. Nyoho, Tochigi Prefecture to meet the Japanese endemic *Pinguicula ramosa*.

On 31 May 2023, the last day of the 13th ICPS Conference in Japan, 27 brave explorers (Fig. 1) climbed Mt. Nyoho, Tochigi Prefecture to meet the Japanese endemic *Pinguicula ramosa*.

Pinguicula ramosa is a cold temperate *Pinguicula* and is so far found in only 5 sites in the Nikko area in Tochigi Prefecture, about 2.5 hours north of Tokyo. What's so unique about this plant is that its flower stalk branches out to hold 1 to 3 flowers (Fig. 2). This is the only *Pinguicula* species which does this weird but amazing thing.

Another interesting characteristic of this plant is that when they fruit, they bend their flower stalks backwards and bury them into the wall of the cliff on which they are attached. Because of the rarity and the sensitivity of the ecosystem where they grow, *P. ramosa* is classified as an endangered species, and considered one of the national treasures of Japan. *Pinguicula ramosa* is



Figure 1: The *Pinguicula ramosa* explorers. In front of the hotel in Kita-senju, Tokyo.



Figure 2: *Pinguicula ramosa* showing branched flower stalks. Photo by Justin Dunning.

also notoriously difficult to grow in cultivation. So, the only way we could see them was to go to where they grow naturally. My role here was to help non-Japanese participants navigate during this expedition.

From the Himeji station, where the conference venue was located, we took the Shinkansen (the Bullet train) to Shinagawa ward in Tokyo. Then we transferred to a local train to the town of Kita-senju where we stayed for the night. I stayed at my folk's place in the town of Koiwa, about 40 minutes away by train. We had bought a ticket for the special train to the Nikko area ahead of time which departs from Kita-senju station the next morning. The Japanese train system is fantastic in a sense that you can get to anywhere you want, but the downside is that it is quite complicated. It seems to me that it gets more and more complicated every year. Kita-senju station is huge and has multiple train lines. The last time I used the train to Nikko was in 2016, when I went to the same site to see *P. ramosa* for the first time. It's been a while since I'd taken this train, and the train systems could have totally changed during this period. I was afraid that I wouldn't be able to navigate the participants around Kita-senju in time for our 8:03 a.m. train, so Naoki Tanabe, the leader of the ICPS conference, jumped in to help me out. He and I met the participants at the hotel lobby at 7:00 a.m. in the morning of the expedition. Then Naoki led us to the correct platform for our train at the Kita-senju station. Boy, was I glad Naoki came just to help us, because the platform where we got on the Nikko train was at the tip of the platform of a different train line (i.e., two train lines shared a single platform)! It would have taken me so long to figure it out, and we would have missed the train otherwise! Another little surprise was that we had to buy an additional ticket to get on the train. It turns out the online ticket we bought in advance was only the "Express" ticket. What we were missing was the "Local" ticket which was

only available by cash at the train station. Living in the US for so long, I completely forgot that we needed two tickets to get on the Nikko train. Why cash only in the year 2023? Why don't they just make them into a single ticket? That's beyond me! Naoki kindly took the train with us and saw us off at the Nikko station.

At the Nikko station, we met Mr. Oshita, the leader of the expedition, and several other participants who came with their cars. Between a rental car and the cars provided by the participants who drove there, we took a c.15-minute ride to the entrance to Mt. Nyoho (many thanks to those who volunteered their cars, especially Ako Minami who made multiple trips to help us get there). It was about a 2-hour climb up the paved road which was made for the dam construction. After that was about a 30-minute climb over fallen rocks and gravel. The path was not too steep but still made my heart race quite a bit. Japanese endemic flora such as *Arisaema nikoense*, *Primula japonica*, and *Rhododendron kaempferi* decorated the path and made the climbing pleasant (Fig. 3).

Here's a side story to it. When we saw *Primula japonica* blooming away down a little hill off to the side of the path, some of us decided to climb down the hill to take a closer look. I hesitated but decided to follow them despite the bad feeling I had about this. "Snap!" the branch I held onto broke off. Down goes Emmi, making a few 360s and landing on her knees and face. It was so painful I couldn't get up for a long time. Apparently, I made a scene as everyone was staring at me. I got some scratches, but luckily, I was still able to walk. It wasn't my knees that hurt so much as my dignity!

Halfway up the path, we saw the *P. ramosa* cliff standing proudly in the distance, a U-shaped cliff wrapping around the south- to north-eastern sides (Fig. 4).

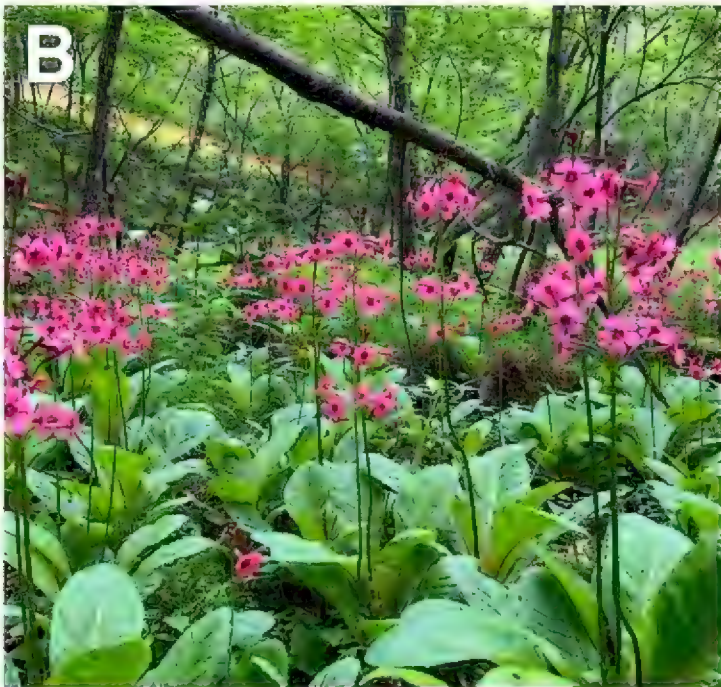


Figure 3: (A) *Arisaema nikoense*. (B) *Primula japonica*. (C) *Rhododendron kaempferi*.



Figure 4: *Pinguicula ramosa* site standing proudly in the distance.

After passing a few “Watch your head for fallen rocks” signs and climbing over the fallen rocks and trees, we finally got to the top of the path where *P. ramosa* awaited us. It was about 1:00 p.m. when we arrived at the site. Back in 2016, the blooming on the south-eastern side of the cliff was already over. But we got to see the “bending” of the flower stalk trying to bury its seed pod into the very wall it’s attached to. However, this year, most of the south-eastern surface area where I saw the *Pinguicula* last time was carved off perhaps due to the erosion, and I did not find a plant except one. The flowers of the plant I saw on the south-eastern wall were mostly spent, but the most remarkable thing was that the plant had a single flower stalk branching into 6 different pedicels (Fig. 5)!

When we came to this site in 2016, we saw an individual with 4 flowers off a single stalk which was a big deal at that time. So having to find a 6-headed individual was beyond amazing



Figure 5: Six “headed” *Pinguicula ramosa*.

and record-breaking! Around the corner from the south-eastern facing walls, on the north-eastern side of the cliff, we found numerous *P. ramosa* in full bloom, hurray (Figs. 6-7; front & back covers)! And as the signs predicted, the cliff was steep and unstable, with an accumulation of crumbling volcanic rocks and gravel which had fallen (Fig. 8).

The plants looked healthy and beautiful. A lavender purple like the color of a kimono with darker stripes on its sides, the flowers had a pair of yellow pollen-guides that were contrasting to the lavender. It's hard to tell by the pictures, but it is a tiny plant (Fig. 9). Dainty but elegant, *P. ramosa* enchanted us all with its beauty.

As we examined the plants, we took care so as not to break off the walls or not to fall off the cliff ourselves. The appearance of the north-eastern facing walls had changed quite a bit from 2016. Erosion had carved some of the surface of the walls away. But *P. ramosa* appeared



Figure 6: *Pinguicula ramosa*. Photo by Justin Dunning.



Figure 7: *Pinguicula ramosa*. Photo by Justin Dunning.



Figure 8: The *Pinguicula ramosa* site, Mt. Nyoho, Nikko, Tochigi Prefecture, Japan.



Figure 9: *Pinguicula. ramosa* with my train pass (size of a credit card) as a size reference.



Figure 10: The waterfall facing the *Pinguicula ramosa* cliff across the valley.

to have grown back over the eroded surface, enjoying the gorgeous view of the waterfall across the other side of the valley (Fig. 10).

The air was cool and moist. Water was trickling down over the surface of walls. I collected the water and measured its quality using a handheld portable device. The water temperature was 14.2°C, pH was 9.1, conductivity was 27.5 $\mu\text{s}/\text{cm}$, and TDS was 19.3 ppm. The conductivity and TDS were low as expected, but pH was high for most carnivorous plants. This is not surprising for *Pinguicula*, however, because they are known to grow in nutrient poor alkaline substrates.

It was already 2:30 p.m. Time to go. Everyone felt sad to leave the place, but we had to catch the last train back to Tokyo. One by one with a heavy heart we started to climb down. Goodbye, *Pinguicula ramosa*. Stay well until we see you again!

NEW CULTIVARS

Keywords: cultivar, *Pinguicula* ‘Kohaku’, *Pinguicula* ‘Koiwa’, *Pinguicula* ‘Sango’
<https://doi.org/10.55360/cpn524.cv524>

Abstract: Three new carnivorous plant cultivars are named and described: *Pinguicula* ‘Kohaku’, *Pinguicula* ‘Koiwa’, *Pinguicula* ‘Sango’.

Pinguicula ‘Kohaku’

Submitted: 22 July 2023

Pinguicula ‘Kohaku’ (Fig. 1) is a hybrid of *P. laeana* and a white-flowered form of *P. moranensis* bred by Emmi Kurosawa at Boston, Massachusetts. The flower of this hybrid is just in between the color of the parental species, expressing a deep, velvety, and elegant mauve color. “Kohaku” is a Japanese word for red and white, depicting the parental heritage. It is vigorous, prolific and blooms all year round.

To maintain these characteristics, propagation must be done only by vegetative means.

—EMMI KUROSAWA • Boston • Massachusetts • USA • emi.kurosawa@gmail.com



Figure 1: *Pinguicula* ‘Kohaku’.

Pinguicula 'Koiwa'

Submitted: 22 July 2023

Pinguicula 'Koiwa' (Fig. 2) is a hybrid of *P. agnata* and a hybrid thought to be *P. gypsicola* × *P. moranensis* bred by Emmi Kurosawa at Boston, Massachusetts. The flower is a lavender purple with a pair of distinct white stripes radiating out from the center of the corolla, with shades of dark purple speckled in between which almost resemble the pattern of fireworks. The pollen-guide and the center of the corolla is highlighted in yellow. "Koiwa" is the little old town in eastern Tokyo, Japan where the breeder grew up. It is also known as the first *Aldrovanda* site discovered in Japan in 1890 by Makino. *Pinguicula* 'Koiwa' is vigorous, prolific and blooms all year round. An interesting feature of this hybrid is that it often forms 6 petals instead of the usual 5.

To maintain these characteristics, propagation must be done only by vegetative means.

—EMMI KUROSAWA • Boston • Massachusetts • USA • emi.kurosawa@gmail.com



Figure 2: *Pinguicula* 'Koiwa'.

Pinguicula ‘Sango’

Submitted: 22 July 2023

Pinguicula ‘Sango’ (Fig. 3) is a hybrid of *P. laeana* and *P. emarginata* bred by Emmi Kurosawa at Boston, Massachusetts. It produces almost iridescent coral-colored flowers quite unusual for the genus *Pinguicula*. The size of the flower is smaller than *P. laeana* but larger than *P. emarginata*. When in bloom, it is quite eye-catching among other blooming *Pinguicula*. The edges of the leaves are also trimmed with coral colors which makes this hybrid enjoyable even when it is not in bloom. ‘Sango’ is a Japanese word for a “coral”, depicting its unusual coral flower color.

To maintain these characteristics, propagation must be done only by vegetative means.

—EMMI KUROSAWA • Boston • Massachusetts • USA • emi.kurosawa@gmail.com



Figure 3: *Pinguicula* ‘Sango’.

